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SYSTEM

OF

PRACTICAL THERAPEUTICS.

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TYPHOID FEVER.

By H. A. HARE, M. D.

In the treatment of typhoid fever there are several very important facts for the physician to bear in mind. The first of these seems self-evident to every one who is familiar with the pathology and morbid anatomy of the disease, namely, that a person once infected by typhoid fever must of necessity pass through an illness the duration of which will depend largely upon his susceptibility and the virulence of his infection. The measures instituted by the intelligent physician may prevent complications, may modify the process in its severity, but they cannot cure the patient in the sense that the physician is able by the use of remedies to arrest at once the progress of the malady, and restore health in every part of a diseased body. This fact does not in any way reflect upon our skill as physicians, because patients suffering from typhoid infection come to our care so long after the act of infection that the bacillus of Eberth is found widely scattered throughout the body, and has already produced changes in particular portions which, having been instituted, can only be recovered from by those processes designed by nature for repair. The mill-owner is well aware that he cannot stop a freshet; all he can do after it has gained access to the floor of his mill is to prevent it from doing any more damage than its very presence necessitates, and he knows that he must wait till the waters subside before he can repair the damage. So in typhoid fever, the disease is already in full possession of the patient when he comes under our care. We can guide him through the difficulty; can materially aid in preventing much damage; but we cannot remove the disease until, like the freshet, the time arrives for the subsidence of the invasion. That this time can be reached earlier in some cases than others by the aid of proper measures is, of course, true; but, aside from the shortening of the illness by supporting the general system and preventing complications or sequelæ, it is very doubtful if the duration of the malady is actually shortened by treatment On the other hand, it may be greatly prolonged by injudicious treatment.

I have just said that typhoid fever can only be recovered from after sufficient time has elapsed to permit of natural reparative processes.

When the patient comes under care his intestinal glands are already diseased, and the healing of the changes which ensue must consume time. A patch of skin which is dead because of exposure to great heat can only be recovered from after enough time has elapsed for the dead skin to come away and new skin to develop. So in typhoid fever, the glandular structure, once damaged, must go through a period of repair. In severe cases the dead tissue must slough and new tissue form. Another important point to be recalled is that typhoid fever differs from some of the infectious diseases very materially in that during its course the whole body is exposed to the specific bacillus, and that the lesions are therefore really multiple. Many physicians do not recognize this fact, and speak of and treat enteric fever as if it were an infection confined to the intestinal tube as diphtheria is to the upper air-passages. Even in diphtheria, however, the toxins are absorbed and produce general systemic changes, although we can limit this toxæmia somewhat by local treatment. In typhoid fever, on the other hand, an intestine totally free from the bacillus of Eberth and from any of the intestinal lesions of the disease may be present, and yet the patient may be at death's door from the infection. The number of cases now on record in which typhoid fever has been present and has caused death, and in which no intestinal lesions have been found post mortem, are many. Attention has been called to this important fact in my book on the *Medical Complications and Sequelæ of Typhoid Fever*.[1] In other words, while it is true that the intestinal glands are the usual and favorite seat of the morbid changes in this disease, it is entirely possible and, indeed, frequent for the infection to expend its energies on the lungs, the cerebral meninges, or other parts.[2] Having learned these facts, other equally important ones are worthy of attention. The first of these is that meddlesome therapeutics designed to abort or jugulate the disease is not only fallacious in theory, but baneful in practice. In no other disease, perhaps, does the maxim, "Let the patient get well," hold more emphatically. The physician must permit natural processes to proceed. He must attend his patient, not to cure typhoid fever, or to treat typhoid fever by any specific means, but to guide and protect him, and oftentimes such guidance and protection are most necessary for the continuance of life.

Again, even if a specific treatment was in existence which would antagonize the development of the specific bacillus and its toxin, it could not be a "cure all," because typhoid fever is practically never a pure infection. Under its influence other micro-organisms ordinarily present and benign become malignant and develop toxic matters which affect the patient's vitality. Typhoid fever is, therefore,

[1] Lea Brothers & Co., Philadelphia, 1899. [2] *Op. cit.*

a disease dependent upon a primary specific disease, and is aided and abetted by other infections. Finally, in the line of general treatment it can be laid down as infallible that no routine plan of treatment of any kind whatever can be laid down as the treatment of all cases of typhoid fever. As long as variations in the susceptibility of patients and in their vitality exist the disease will vary—the more so because the cause of the disease itself also varies in activity. It is fortunate that this is true, for were it not so there would not be any real need of the physician in the case at issue. As a matter of fact, he is needed to recognize the peculiarities of each case, and to adapt the remedies to the needs of that particular patient. From these preliminary remarks it will be understood that in the following pages the remedial measures advised will not be needful in all cases; on the contrary, they will be needed in some, not in all, and conditions may arise which will contraindicate some of them.

Preventive Treatment.—There is no disease distinctly infectious in its nature which can be so completely controlled and prevented as typhoid fever; and this, too, by means which even the laymen of the lower classes can institute if they can be first convinced of the necessity of protecting themselves from the malady. This article has not space which can be devoted to detailing instances in which lack of sanitary laws or disobedience of them has resulted in giving us extraordinarily clear illustrations of the spread of the disease by carelessness. Almost every State and city affords instance after instance in which criminal neglect of these laws of health have resulted disastrously. Some years ago I visited Cumberland, Maryland, to investigate the cause of an epidemic of typhoid fever in that town. The so-called water-supply was new and theoretically correct, but for a time the pumping-station drew water from an old main extending out in the bed of the river. Into this flowed a creek, which emptied in such a position that a large amount of its flow at once entered the pipe. Notwithstanding this fact, the houses near by and for some distance up the stream were fitted out with privies which overhung the bed of the creek in such a manner that fæcal matter which left the patient in the morning might perhaps enter that patient a few hours later in his drink or food. Such filthy water produced much diarrhœa, and it needed only the introduction of a single case of typhoid fever to provide the specific bacilli, which speedily produced an epidemic of typhoid fever. Another historical instance of similar ignorance of laws of cleanliness is to be found in the epidemic which occurred at Plymouth, Penna., an account of which is given in most of the recent American text-books on medicine.

It is a mistake, however, to suppose that typhoid fever is spread by water alone. Wide observation and bacteriological research have

proved that the bacillus may enter the body with all kinds of raw food; and epidemics have occurred in which oysters planted in river waters, for the purpose of fattening them, have become the host of the bacillus of typhoid fever, and when eaten raw have conveyed the infection to human beings. Raw clams have done likewise, and doubtless uncooked celery, lettuce, and cabbage often act in a similar manner. That this accident is very prone to occur is evident when we recall that "truck growers," in order to force their vegetables, often use as much fæcal matter as possible for fertilizing purposes. A well-known bacteriologist recently told the writer that he knew of cases in which less than three weeks elapsed between the passage of a typhoid stool and its spread over a vegetable patch. Under these conditions it is surprising that the malady is not more widespread.

At all times, therefore, we must protect the water-supply, and in the presence of an epidemic boil the water and eat only cooked food. It should be remembered also that Prudden and others have shown that the process of freezing does not destroy the typhoid bacillus, and therefore the addition of ice of unknown source to water which has been boiled may be introducing the bacillus after the preventive measure of boiling the water has been taken. Indeed, the amount of filth to be found in every glass of water after ice has melted in it shows that this material carries into our drinking-water much foreign matter.

Aside from these general prophylactic measures, there are others in connection with the patient himself and his discharges which are not to be ignored. Here, after all, lies the primary means to resist the spread of infection; yet the patient's attendants are often outrageously careless of the ordinary means of destroying the infected materials. In country practice this is often found, and even in cities and in otherwise well-managed hospitals great carelessness is met with. It seems scarcely necessary to state that all the clothing and bedclothes of a patient should be disinfected by being placed in boiling water and boiled as soon as they are taken from him; yet, very commonly this is not done, and, still more commonly, they are washed in water which is not boiling, and with the clothes of the rest of the family. The attendants of such cases ought not to nurse other patients suffering from other maladies if it can be avoided, and they should be warned about the danger of infection. Always, after handling the bedclothes of a patient or any article contaminated by him, the nurse should carefully wash her hands and scrub her nails. Cases are not rare in which attendants have infected themselves by carrying with their food to their mouths germs clinging to the hands.

In regard to the discharges of the patient, let us speak first of the stools. These should always be received in a vessel that has been

partly filled with some active disinfectant, such as acidified corrosive sublimate solution, which should be kept in a colored solution, so that it will not be given internally by mistake for drink or medicine. It must be acidified, so that it will not form, when added to the stools, an insoluble albuminate of mercury, which is, of course, devoid of bactericidal power. When corrosive sublimate is too expensive, chlorinated lime, freshly dissolved in water, may be placed in the vessel ; but it must be of such strength that the face cannot be held over the lime itself before solution, because of the irritation of the eyes produced by the chlorine which is given off. Much of the so-called chlorinated lime of the stores has long since parted with its chlorine gas in great degree. The nurse must not be satisfied with the mere presence of the disinfectant solution in the pan. Before the contents of it are thrown out the fæcal matter must be thoroughly dissolved or mixed with the disinfectant, as otherwise only the surface of the discharge is disinfected. This must be insisted on the more because, being a disagreeable process, it is apt to be shirked, and because apparent, and not real, disinfection develops a sense of apparent safety that is not real. Finally, the stool should not be immediately thrown out, but it should be kept in contact with the disinfectant for many minutes till sufficient time has elapsed for the germs to be destroyed.

While physicians have known for years that the stools should be disinfected, it has only been recently that the importance of disinfecting the urine has been recognized by reason of the enormous numbers of the specific bacillus found in this secretion in the course of the disease. Thus, Petruschky has estimated that as many as 172,000,000 bacilli may be found in a single cubic centimeter of the urine of a typhoid fever patient. Among those to whom the profession is under obligation for having emphasized this fact may be named Richardson, of Boston ; Blumer, of Baltimore ; and Horton-Smith, of London.

Horton-Smith finds that the stools of a typhoid fever patient, if carefully separated from the urine, so that they are not contaminated by that secretion, contain typhoid bacilli in fair quantities up to about the beginning of the third week, and that after this date the number diminishes rapidly, except if a relapse occurs, when they are again to be found in the fæces, although they cannot be found during convalescence. In other words, the stools of typhoid fever patients are to be regarded as highly infectious during the early stages of the disease, and during a relapse ; but their infectiousness speedily diminishes with the progress of the malady. So thoroughly is Horton-Smith convinced of this that he believes all those cases in which typhoid bacilli have been found in the stools late in the disease to be due to contamination of the fæces by urine laden with bacilli.

On the other hand, it would appear that the urine is not always laden with these micro-organisms, for out of sixty cases positive results were obtained in only fifteen, and negative results in forty-five; or, in other words, the typhoid bacilli were observed at some period of the disease in the urine in 25 per cent. of the cases. Curiously enough, the appearance of the micro-organisms in the urine as to time is the reverse of thier appearance in the fæces, for while, as we have already stated, they appear in the fæces during the first three weeks in largest numbers, they appear in the urine much later, varying from the fifteenth to the thirty-ninth day, and have not been observed in any case prior to the fifteenth day. One instance has been recorded in which the bacilli were in the urine seventy days after the beginning of the malady. The fact, however, that the bacilli are not always present in the urine in no way justifies the physician in neglecting to disinfect this secretion, for when the bacilli do occur in the urine they are nearly always of pure culture, and may be in such numbers as to cause turbidity in the fluid, which would otherwise be clear.

Antityphoid Inoculations.—Very many experiments have been made by laboratory workers and clinicians in the hope of discovering a serum treatment for typhoid fever. Not only has the attempt been made to obtain an antitoxic serum, but at various times cultures of the specific typhoid bacillus and other bacilli have been injected in the hope that good results would ensue. In certain instances living, but attenuated, bacilli have been employed. So far, all attempts have been practically futile. The nearest approach to success in the way of protecting an individual from the ravages of the disease is the employment of the so-called "antityphoid vaccination." This measure has been more largely used by Wright, of Netley, England, than by any one else. His first injections were made in July, 1896, and since then he has been continually studying this subject. As a result, he reports in the London *Lancet*, of January 30, 1900, upon the method which he has used. These statements are of very great clinical interest. The vaccine material which he used consisted of four weeks' old cultures of virulent typhoid bacilli which contained 1 per cent. of lysol. These cultures had been prepared about twelve months previously. They had been sterilized by an exposure to 60° C. The quantity of culture which was employed for each inoculation varied between 0.5 and 0.75 c.c. This last was the minimum quantity which was fatal to 100 drachms of guinea-pig. The results of these injections were not serious either locally or generally. The men who were inoculated suffered slight pain and very little tenderness about the seat of the inoculation, and there were some fever and a general malaise which lasted from a few hours to three or four days. Very rarely the symptoms continued for a longer period. While the

results which have been obtained by Wright are not sufficiently positive to justify us in considering that we have a true protection against typhoid, at the same time it cannot be denied that his figures are most encouraging. Thus, out of 11,295 men under observation, 2835 were inoculated and 8460 were not. The percentage of cases of typhoid fever amongst those who were not inoculated was 2.5, and amongst the inoculated 0.95, which is certainly a very extraordinary difference. Unfortunately, the statistics in regard to mortality are not equally good. The percentage of deaths amongst the uninoculated was 0.34, and amongst the inoculated 0.2. Reports as to the results of inoculations of soldiers going to South Africa in the present English-Boer War have not yet come to hand.

Considering the very widespread character of typhoid fever in times of peace and its still greater ravages among soldiers and others in times of war, these preventive inoculations, and the statistics which Wright ought to be able to present to us in the course of a few months, will be looked forward to with the greatest possible interest.

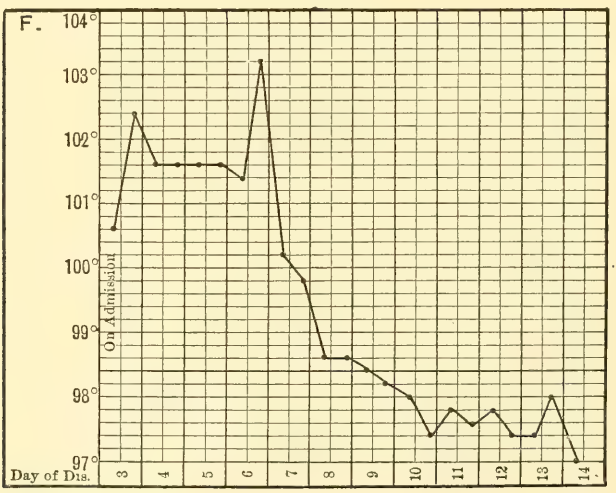
The whole theory of this method of treatment, of course, depends upon the fact that by the injection of this material an artificial immunity is conferred upon the individual who receives it. In other words, he receives a dose of poison not sufficiently strong to do him serious damage, and yet sufficiently strong to stimulate his protective apparatus so that he will be able to resist the disease. In all probability we will never have an antityphoid vaccine which can modify the attack of the disease as does ordinary vaccination abort smallpox, since the onset is insidious and the exposure is usually not recognized until sufficient time has elapsed for the disease to thoroughly infect the patient before it is discovered. Further than this, these cultures, injected hypodermically, do not have sufficient time to produce immunity before the disease comes upon the patient if the infecting microorganisms have already entered his body some days before in the ordinary manner. These injections, therefore, are quite different in their primary nature and in their effects from those methods which are used for the prevention of smallpox by cowpox vaccine.

Treatment in the Course of the Disease.—It was pointed out in the beginning of this article that the best treatment of a mild case of typhoid fever is not to be meddlesome with remedial agents, and, before speaking of the medicinal or other measures which are needful, let us define what is meant by a "mild case."

In the first place, we must recall the fact that typhoid fever occasionally occurs in such a mild form that it cannot readily be diagnosed. In the mildest of these cases there is little to be found indicative of enteric fever save, as Liebermeister puts it, "the long duration of an apparent trifling indisposition in which the patient

presents a general impairment of health, malaise, physical and mental depression, and headache with loss of appetite, the tongue being coated, and the pulse often distinctly slower than normal." No fever may be present. So moderate may all the symptoms be that a differential diagnosis between subacute gastro-intestinal catarrh and mild typhoid fever may be practically impossible except by the aid of Widal's test, which rarely gives results so early as the days of onset. Certain German writers have gone so far as to assert that all cases of subacute catarrh of this character depend for their existence upon mild typhoid infection. Not only may the course of the malady be very mild, indeed, but its length may be so brief as to throw doubt on its specific character, the whole illness lasting twelve to seventeen days, and then recovery being established. Sometimes even less time elapses before the fever ceases and the patient is manifestly convalescing. Then, again, the abortive type of this disease presents itself, in which after an illness beginning with quite characteristic manifestations, often of considerable severity, the symptoms rapidly ameliorate, and convalescence is established within ten days of the onset. This is well illustrated by the following temperature-chart of a student recently under my care. On

Fig. 1.



Abortive typhoid fever ending by the seventh day, and by crisis instead of lysis.

March 8th he first began to suffer from symptoms which were severe enough to make him seek medical aid and go to bed. Prior to this date he had felt but slightly unwell, and this for only a few days. As is seen in the chart, his temperature fell by crisis on the seventh

day of his illness, although the positive Widal reaction endorsed the diagnosis of true typhoid fever. Curiously enough, such cases are often ushered in suddenly by marked signs—high fever and indications of grave illness—and yet so speedily pass on to the fall by lysis that it seems as if the attack must be due to some other infection. Such cases are recorded in which an initial fever of 106° F. in the axilla has been followed by a normal temperature as early as the seventh day. Manifestly in such a case as this medicinal treatment is not needed, and cool or cold sponging is all that is required for the purpose of reducing the fever, which may be high.

When the fever is mild or absent all the physician can do is to put the patient to bed, administer mild alkaline diuretics to flush the kidneys, and unload the bowels, if they be constipated, by a little calomel and a saline purgative. This having been done, the diagnosis can only be arrived at by a careful study of the temperature and the tongue, the size of the liver and spleen, and the state of the bowels. It must not be forgotten, however, that a mild onset does not betoken by any means a mild course of the affection, for in many instances the milder symptoms are simply the very early signs of a severe infection. On the other hand, it is equally true that very violent symptoms in onset often present themselves in cases which will subsequently pursue a very mild course. For these reasons, therefore, the physician who meets with a seemingly mild case at its onset must not be surprised if it gradually becomes worse; nor must he, on the other hand, be unduly elated over the success of his treatment if, after heroic efforts on his part, the patient soon passes into an easy and smooth convalescence.

The presence of a high fever at onset may not only be of the variety just described, but be due to abnormal conditions complicating the ordinary form of the disease, and its very appearance should cause the physician to look carefully for these accidental lesions. Thus it is possible for an early pneumonia to develop, or pleurisy may occur, and, more likely still, meningeal or cerebral symptoms may be manifest. Closely associated with these causes of very marked febrile movement is the presence of malarial infection. This is, however, far less commonly present than has been thought to be the case in the past. Improved methods of diagnosis, chiefly in connection with the blood, have shown that while typhoid and malarial infection may exist simultaneously in one individual this is rare; and further, that when the double infection exists the malarial organism often disappears from the blood and ceases to produce any effect that we can demonstrate until the typhoid process has run its course. In the early days of the illness, when the malarial infection is active and the typhoid infection is just gathering energy, so to speak, the fever may be chiefly malarial, but later on

the enteric infection is the cause of the disturbance of temperature. It is of very great importance that these facts be carefully borne in mind, the more so as malarial fever complicating typhoid fever is the exception, not the rule. Without doubt, in all cases in which decision as to the diagnosis is difficult the physician should examine the blood first by the so-called Widal test; and second, if need be, by the necessary search for the malarial parasite. Now that every city and many of the large towns are possessed of physicians who have the training necessary to these examinations and can use a dried drop of blood on a sheet of writing-paper for the Widal test, there can be no excuse for failing to call to our aid this important diagnostic aid in obscure and doubtful cases.[1] The remarks just made hold true, not only in regard to the suspicion of malarial infection in the early stages of the disease, but also in the later stages, as will be pointed out further on.

The question naturally arises as to whether in cases of this character we are justified in using quinine on the principle that if malaria is present it will do good, and that if it is absent it can do no harm. Aside from the fact that the use of any drug in this way is distinctly irrational, quinine is capable of increasing the headache, disturbing the digestion, and increasing the constipation or diarrhœa if either be present. If the quinine be resorted to at this time for diagnostic and therapeutic purposes, it should be made a rule that it is not to be persisted in for more than three or four days, since if full doses be given in malarial infection at proper times the fever will be markedly affected, while if it be due to typhoid fever it will pursue its course unaffected at least to any great extent. Further than this, during the time that this therapeutic test is being made the patient should be considered as a case of enteric fever and kept rigidly in bed on a proper diet.

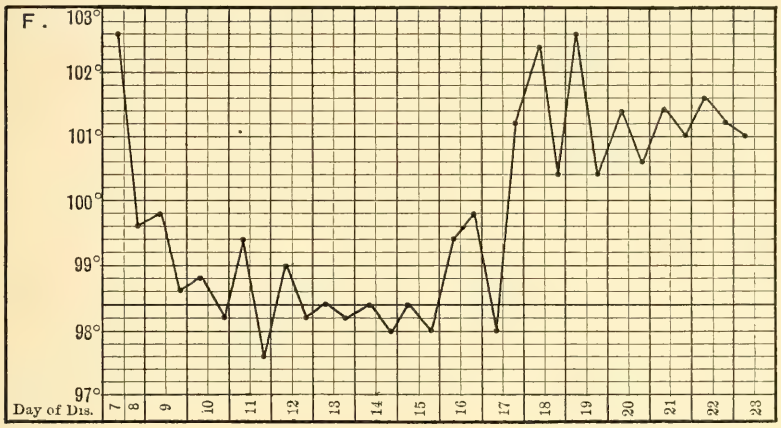
Finally, in connection with this subject it must be remembered that chills, fever, and sweats may occur in typhoid fever as well as in malarial fever; and therefore their presence does not prove that the malarial germ is responsible for the symptoms presented.

Unfortunately, the diagnostic signs of typhoid fever may be aped, not only by malaria, but one of the conditions which may produce similar symptoms is appendicitis. An interesting case illustrating how difficult the diagnosis of typhoid fever may be in its earlier stages has recently been under my care: This woman was taken ill some days before I saw her with chilliness,

[1] The Widal test consists, it will be recalled, in the fact that if a drop of liquid containing living typhoid bacilli is mixed with a little blood, dissolved in water, the bacilli very soon cease their active movements under the microscope and finally become perfectly still and clumped.

fever, and languor, and with a further history that she had been suffering for a number of months from somewhat similar sensations, without the fever, and had been losing flesh; during this time she had constipation alternating with diarrhœa and abdominal pain. When first seen her temperature was 103° F., and her appearance was distinctly that of a typhoid patient; but, as is seen in the accompanying chart, her temperature speedily fell to normal, only one sponge

FIG. 2.



A case of typhoid fever preceded by appendicitis (?), or by a primary attack of typhoid fever.

bath being required after she came under observation. An examination of her abdomen at this time revealed the fact that it was slightly protruding, and that the abdominal wall was so thin that the coils of the intestine could be readily seen projecting through it. In the neighborhood of the umbilicus there was a sense of increased tenderness on deep palpation, and the resistance made one suspect the possibility of there being present a tubercular peritonitis which had caused an exudation, binding the intestines together in a mass. About McBurney's point there was a very distinct tenderness on light palpation, and deep palpation produced severe pain. In view of her history, her emaciation, and the symptoms detailed, I was inclined to consider the case one of tubercular peritonitis, or else one of appendicitis of a subacute or chronic character, with a tendency to exacerbations. In this opinion Professor Keen agreed with me, and it was arranged that he should perform an abdominal section for the purpose of removing the appendix, if it alone was the cause of the difficulty, or of relieving the tubercular peritonitis through the well-known beneficial effects of abdominal section. On the day on which she was to be operated upon, her temperature having been normal for a num-

ber of days, and her general condition having steadily improved under treatment designed to prepare her system for operation, she developed marked languor and malaise and febrile movement, which is shown in the chart (Fig. 2), and three days later developed the typical rose rash of typhoid fever, her blood giving the positive Widal reaction simultaneously. The questions which naturally arise with regard to this case are: Did the woman suffer primarily from appendicitis or from tubercular peritonitis? Did she come under my care at the end of a mild primary attack of typhoid fever, after which she had a relapse? Or, again, is it possible that, suffering from a mild chronic intestinal catarrh, she received typhoid infection just prior to her entering the ward, thereby superimposing typhoid fever upon the conditions present when I first saw her? Because of her ultimate complete recovery I am inclined to believe that the primary fever could not have been due to tubercular peritonitis.

The history of previous attacks of appendicitis, the presence of great tenderness in the region of the appendix, a hard, "board-like" belly without tympanites it may be, and the presence of appendicular pain increased by palpating the appendicular region through the rectum, will aid in differentiating the disease from typhoid fever. Sepsis and appendicitis may somewhat closely resemble typhoid fever if the latter affection is insidious and there is pus present which produces toxæmia.

Whatever the cause of the sepsis may be, the loss of flesh, dry tongue, delirium, low grade bronchitis, badly nourished skin, and diarrhœa may cause the patient to be most typhoidal in appearance, yet in all such cases we should seek for a possible purulent focus. The absence of the Widal reaction and the presence of leucocytosis should rouse our suspicions greatly, and it is not to be forgotten that the presence of pus deep in the pelvis or in the neighborhood of the kidney may not be readily discovered, and only the development of fluctuation or the rupture of the abscess will force the physician to revise his diagnosis of typhoid fever. On the other hand, as already pointed out, purulent formations may occur in typhoid fever. Similar facts make us suspect and search for signs and causes of ulcerative endocarditis in such cases. The facts that tuberculosis may simulate typhoid fever, and that cerebrospinal meningitis may likewise do so, are to be carefully borne in mind; and it is not out of place to point out that four types of tuberculosis are particularly apt to produce misleading symptoms. In tubercular meningitis the febrile movement is rarely as high as in typhoid fever with associated meningeal symptoms; the abdomen is usually scaphoid instead of tympanitic, and the persistent vomiting of the former disease is comparatively rarely met with in the latter. An ocular examination may reveal

optic neuritis in tubercular meningitis, or paralysis of the muscles of the eyeball, causing squint. So, too, in acute general miliary tuberculosis the previous history of the patient as to gradual failure of health, and cough, the moderate fever, and the rigors and sweats, point to the presence of tuberculosis rather than enteric fever. Further, there will be in some cases marked physical signs of widespread involvement of the lungs in tuberculosis which will be absent in typhoid fever. It is to be recalled, however, that a roseolous rash may develop in both affections, and that diarrhœa and a dry, brown tongue may mislead the careless very readily. Even intestinal hemorrhage may occur in miliary tuberculosis. Tubercular peritonitis may also cause typhoid symptoms; but as the disease progresses the localization of the abdominal symptoms, and, finally, the development of tumor-like masses or enlargement of the mesenteric glands, which can be felt on deep palpation, or in other cases the development of ascites makes the diagnosis clear. It is not necessary for the rather rare disease, general miliary tuberculosis, to be present to make the diagnosis obscure. Some time since I saw in consultation a man of thirty years who had had for four weeks persistent fever, some cough, diarrhœa, mild delirium, gradual loss of flesh, and a heavily coated tongue, with sordes. To the attending physician, who had made a diagnosis of enteric fever at the start, nothing had occurred to make him change his views, but the appearance of the patient made me suspicious of tuberculosis, and a careful examination of his chest revealed well-advanced tuberculosis of the lungs, the real cause of his illness.

Girandau has recorded a case in which a young man suffered from enteric fever, and then speedily developed tuberculous disease of the intestines. Two weeks after recovery from the enteric fever the patient became ill a second time with diarrhœa, fever, abdominal pain, and marked wasting. At the autopsy two sets of lesions were found, typhoid lesions side by side with tubercular foci. No traces of old pulmonary lesions or a primary lesion elsewhere were to be found.

Another interesting case, illustrating how difficult these differential diagnoses may be, is reported by Dreschfeld, in Allbutt's *System of Medicine*, in which three members of one family that had lived in a cellar which had been under water at the time of an extensive flood were attacked with a fever. Their symptoms closely resembled those of enteric fever, and one of them presented on the third day after admission marked roseolar spots, and had slight intestinal hemorrhage on the fifth day. The temperature showed marked exacerbations, and the patient died from exhaustion on the fourteenth day after admission, or about the seventeenth day of the fever. The post-mortem examination revealed the intestines apparently healthy.

Dreschfeld says he can quote similar cases. He does not state what he believed this illness to be due to, but from the context he evidently regarded it as septic; although the absence of intestinal lesions, as I have already stated, does not exclude enteric fever.

Leu has reported a case of puerperal septicæmia that was almost indistinguishable from typhoid fever, for the patient had a rose rash, tympanites, enlarged spleen, intestinal infection, and the pyrexial curve, which is characteristic. The facts that puerperal septicæmia is usually fatal within a few days; that there is a local focus of the disease; and that such a disease would not present the Widal reaction aid us in making a differential diagnosis.

Another condition which may closely simulate enteric fever is the gastro-intestinal form of epidemic influenza, for in this condition we have enlargement of the spleen, diarrhœa, tympanites, gurgling, slight evidence of bronchial irritation, and, very rarely, indeed, a suspicious roseolar rash. On the other hand, it is perfectly possible for enteric fever and influenza to occur simultaneously in the same patient.

Under the name of *mountain fever* a febrile disease occurring in the great highlands which occupy the Western portion of the United States, has been described by a number of authors. Some of these writers have been strongly of the opinion that mountain fever is a distinct entity, while others have gone so far as to assert that it is an irregular manifestation of malarial poisoning, and still others that it is a modified form of typhoid fever. As a matter of fact, we may state positively at this time that true mountain fever is in all cases nothing more than a greatly modified or altered type of typhoid infection. As has been pointed out a number of times, typhoid fever is a disease which varies greatly in its symptomatology and course, and does not, in many instances, follow the classical descriptions of it which we are accustomed to find in the text-books.

One of the most conclusive and interesting papers dealing with this matter, which is to be found in recent literature, is that of Raymond, who, as post surgeon at one of the United States Army stations in the West, has contributed to the *American Journal of the Medical Sciences*, 1898, vol. cxv., an exhaustive paper upon this subject.

Quinine administered in full doses to these cases failed to exercise any beneficial effect; prophylactic measures which are ordinarily successful in the control of a typhoid epidemic at once checked the disease, and a comparison of many of the symptoms manifested with those met with in irregular forms of typhoid fever still further indorse the view we have already expressed in regard to the unity of these two diseases.

These views in regard to mountain fever are also supported by the paper of Work, who tells us that eighteen out of fifty cases of mountain fever, so called, had rose spots, and that in five fatal cases the intestinal lesions of typhoid fever were found.

The differential diagnosis of typhoid fever in children from the other exanthemata is made as follows: From scarlet fever, by the pain in the back, the excited nervous system, the eruption on the second day, and the absence of pain in the abdomen and the stupor of enteric fever. There is usually in scarlet fever, too, marked sore-throat. From measles we are apt to have greater bronchial catarrh, at least at first; coryza, which is very rare in typhoid fever; and an early eruption. From enterocolitis we distinguish enteric fever by the absence of delirium or stupor in this affection, and the character of the diarrhœa, as well as the greater abdominal tenderness. The value of the Widal test in these cases is never to be forgotten.

Having excluded the possible conditions which may mislead the physician as to his diagnosis and treatment, we can proceed to a consideration of the treatment of an ordinary case of the disease which is about to pursue an average course. If the patient is seen in the first week, when constipation is nearly always present, there can be no doubt whatever that a moderate dose of calomel is advisable, and indeed necessary in nearly every case. Not only does it tend to move the bowels and thereby place them in as healthy a state as possible, but in addition it makes us tolerably sure that symptoms of toxæmia, if they develop, are due to the typhoid fever, and not to retained fæces; and again, the liver is placed in a condition in which it can, as far as possible, exercise its important function of destroying toxic material absorbed from the bowels. Sometimes, if the bowels are easily moved, the calomel does not have to be followed by a saline purge, and if any tendency to diarrhœa is present the latter may be advantageously omitted.

It having been proved clinically and experimentally that all fevers, and particularly prolonged and exhausting ones like typhoid fever, diminish greatly or entirely put aside the secretion of gastric juice, practically every patient will digest food better if dilute hydrochloric acid in five or twenty drop doses be given every four hours, or at least three times a day. By this means gastric activity is preserved, and the tongue is kept clean and moist, partly as a result of the improved state of the stomach, and partly because the acid prevents the accumulating of sordes on the tongue. This acid should be given after, rather than before meals, and be well diluted for obvious reasons. Not only should this acid be used, but the patient should be urged to partake freely of pure cool water; and this urgency on the part of the physician and nurse should be the more

constant if the patient be stuporous, since in this state he will often be too stupefied to appreciate thirst and ask for water. At no one time should he be given large draughts of liquid; but if every hour or two a few tablespoonsful of cool water are given it will not only preserve the activity of the secretions, but also aid in flushing impurities out of his body by the kidneys. Further than this, it will prevent extensive emaciation. So large a part of the body-weight is made up of water that much of the wasting in some cases, when not given enough water, depends upon a drying up of the tissues.

We next come to the important question of diet, and in this direction the writer feels called upon to urge most strenuously a more liberal amount of feeding than has been resorted to heretofore by most physicians. One of the gravest dangers which threatens the continuous success of the busy practitioner is the tendency to relapse into what is known as routine treatment, which consists either in prescribing identical preparations to patients with the same general disease, but with different manifestations, or adhering rigidly to fixed lines of diet when a little thought and care will enable him to vary the diet, and so improve the nutrition of the patient. At least he need not enforce strict adherence to a particular line of food-products. In no disease is the importance of liberal feeding greater than in typhoid fever, for in this malady the patient, through a number of weeks, has his strength continually sapped by fever, diarrhœa, and the various complications of this malady, with the result that at the end of even a mild attack he finds himself in convalescence miserably weak and lacking both nervous and muscular energy. It is a noteworthy fact, familiar even to the laity, that this lack of power of mind and body often lasts for many months after apparent recovery has taken place. The question naturally arises whether this atony and asthenia are an unavoidable consequence of the disease; and, if so, whether it is possible to modify them to such an extent that convalescence may be more rapid and that recovery from the attack itself may be the sooner arrived at. It has been the custom of a great number of the profession for many years to order an absolute milk-diet for patients suffering from typhoid fever, and to continue them on this diet for a number of days or even a week after the fever has disappeared and the temperature of the patient has been normal. Further than this, this diet is frequently insisted on when complications of typhoid fever arise which still further aid in decreasing the patient's vitality, and often a milk-diet is insisted upon when it seriously disagrees with the patient, who because of idiosyncrasy, or because of some complication of his disease, is unable to digest milk properly. I have reached these conclusions not only from general and personal experience in which I have recently had

ample opportunity to become convinced of this matter, but by reason of an article published by Frederick C. Shattuck, of Boston, upon this topic. After some general considerations he tells us that from 1886 to 1893, 233 cases of typhoid fever were treated in the Massachusetts General Hospital under a milk-diet, with a mortality of 10 per cent.; from 1892 to 1897, 147 cases have been treated under a much more extended diet, with a mortality of 8.1 per cent. He fully recognizes the liability to error in reckoning from too small figures in any infectious disease; and while he does not urge that this slight decrease in mortality may have been due to the more liberal diet allowed, it certainly points to the fact, as he thinks, that the more liberal allowance of food has no deleterious effect.

Shattuck believes that we should treat the patient rather than the disease, and feed him with reference to his digestive power rather than solely with reference to his fever, particularly as there are many articles of diet other than milk which can by no possibility exercise a harmful influence upon the intestinal ulceration. The diet-list which he allows, and which would certainly be considered very liberal in the average hospital and in many cases of private practice, is as follows:

1. Milk, hot or cold, with or without salt, diluted with lime-water, soda-water, Apollinaris, Vichy; peptonized milk; cream and water; milk with white of egg, buttermilk, kumiss, matzoon, milk-whey, milk with tea, coffee, cocoa.

2. Soups—beef, veal, chicken, tomato, potato, oyster, mutton, pea, bean, squash; carefully strained and thickened with rice (powdered), arrowroot flour, milk or cream, egg, barley.

3. Horlick's food, Mellin's food, malted milk, somatose.

4. Beef-juice.

5. Gruels; strained corn-meal, crackers, flour, barley-water, toast-water, albumin-water with lemon-juice.

6. Ice cream.

7. Eggs, soft boiled or raw; egg-nog.

8. Finely minced meat, scraped beef; the soft part of raw oysters; soft crackers with milk or broth; soft puddings without raisins; soft toast without crust; blanc mange, wine, jelly, apple-sauce, and macaroni.

There are several articles in this list which we believe few, if any, typhoid fever patients ought to receive, and these are the soups, the beef-juice, and the finely minced lean meat. In our experience, all of these preparations tend to produce or to aggravate pre-existing diarrhœa; and beef broth, as is well known, provides a very favorable culture-medium for the typhoid bacillus. We have frequently seen the use of animal broths substituted for milk, and active, ill-smelling

diarrhœa, with great flatulence, has followed. To the list just given we may add soft custards; and, instead of limiting the patient to milk, with white of egg, we have recently seen most valuable results follow the administration of an egg boiled just long enough to take away its raw taste and yet not to harden the white. From one to six eggs prepared in this manner, and administered to the patient by means of a spoon or in a cup, if he is strong enough to drink the egg, will do much toward maintaining strength, particularly in those cases in which milk disagrees.

We are wont to forget that the human body is so arranged that it must receive a certain quantity of proteids, carbohydrates, and fats if it is to maintain its normal equilibrium, and when this normal equilibrium is perverted by an infectious disease of a prolonged and exhausting character it would seem evident that all these articles of diet should be present in the patient's diet-list, rather than that they should be limited or entirely cut off.

In nearly every case of typhoid fever we meet with constipation or diarrhœa, conditions which may exist alternately; but more commonly one or the other alone is present all through the attack. For years it was thought that one of the pathognomonic signs of this disease was diarrhœa, but at the present time a very large number of cases are constipated from the beginning to the end of the attack. This is particularly so in young adults and children. Students very often seem to have the idea that the absence of diarrhœa in a given case is an important point against the diagnosis of typhoid fever. On the contrary, it is so often absent that its absence is of no negative value whatever, although its presence possesses more importance. Certainly, constipation is much the more frequent state as we meet the disease in Philadelphia; and as Osler well points out, diarrhœa occurs in Baltimore in not more than 30 per cent. of his cases, and in an active form in only about 12 per cent. So, too, we find that in Curschmann's clinic, from 1880 to 1892, diarrhœa was met with in only 25 per cent. of the cases (1626 cases). Phillips tells us that of 200 consecutive cases in St. Mary's Hospital, London, diarrhœa occurred in 115, constipation in 48; but in many of these cases diarrhœa had been set up by a purge given before the diagnosis was made, so that his experience in no way militates against the statistics just cited. In the Maidstone epidemic 50 per cent. of the cases were constipated. Murchison found diarrhœa to be present in 93 out of 100 cases.

When the diarrhœa is excessive, amounting to ten or twenty stools a day, the diet has usually been faulty in the extreme; or ulceration of the large bowel, amounting to a dysenteric state, is generally present.

The character of the stools is usually, in the cases with moderate

diarrhœa, quite typical; but green stools in typhoid fever are occasionally met with. They have been referred to by Dreschfeld, in Allbutt's *System of Medicine*, the discoloration being seen during convalescence. Quill has recorded a case in which bright green material was vomited on the eighth day, and later the patient passed bright green fluid stools. There was much pain in the back. Garrod, Drysdale, and Kanthack report three cases. The stools resembled chopped parsley, and the liquid portion of the stools when filtered off contained biliverdin, which was probably responsible for the discoloration of the excreta.

The next point to be considered in this connection is whether diarrhœa is a sign of mild or severe infection. The consensus of opinion seems to be that diarrhœa is usually more active in serious cases. Whether this is an instance of "purging as an effort at elimination," a favorite theory with those who are fond of using purgatives and so-called intestinal antiseptics, with the idea that by so doing they eliminate poisons and prevent their formation; or whether it is a manifestation of severe ulceration of the bowel with an associated catarrh, is difficult to determine. Ord agrees with the view that diarrhœa is usually associated with ulceration, and his opinion has been confirmed by the autopsies he has seen. Peabody states the case exactly opposite to this view. That Ord's view is not correct seems proved by the fact that advanced ulceration is often found in cases which have not had diarrhœa, and cases of marked diarrhœa are seen in which the autopsy does not reveal much intestinal ulceration. In Bryant's case, already quoted, diarrhœa was active, yet no intestinal lesions were found. In all probability, diarrhœa is indicative of neither a severe nor a light attack in many cases, although if it be violent the exhaustion produced by the discharges may seriously imperil the patient's chances of recovery. This view is strongly advocated by Sidney Phillips, who regards diarrhœa as a symptom adding danger to the progress of the typhoid, as he believes it prevents absorption of nutriment and drains the body of fluid; he is, therefore, distinctly opposed to the so-called "purgative treatment." There is not space at my disposal to discuss the various plans of treatment which have been advocated for the treatment of typhoid fever by purgatives continuously administered, as, for example, the method of Thistle; or of purgatives with so-called intestinal antiseptics, after the plan of other physicians. It would seem evident that in any malady in which fermentation-changes are taking place in the bowels it is the part of wisdom to see that they are moved once or twice a day, and, therefore, all cases of typhoid fever should have at least one movement in each twenty-four hours, and one which is large enough to show that no fæces are accumulating from day to day. So,

too, it is evident that unnecessary purgation is not needful. The rule in the disease is like the rule in health, namely, that a man must have his bowels moved often enough to rid them of their contents, and that they must not be moved so often that he is depleted or starved by the too rapid passage of his food through the bowel. If, perchance, an otherwise healthy man finds himself flatulent or suffering from abdominal pain, he will usually take a laxative or purgative to relieve himself; and if in typhoid fever signs of fermentation, toxæmia from intestinal absorption and tympanites come on in a case which is somewhat constipated, laxatives or purgatives are needed temporarily; but they are not needed all the time as a rule. The advocate of incessant purgation is no more correct than the advocate, if he exists, of constipation. The man with correct views is he that knows when to give purges and when not to give them, and any other use of such remedies is not rational.

The drugs best suited for the relief of constipation are calomel, if the tongue is foul and the patient has not had the drug earlier in the malady; or, preferably, cascara sagrada in the form of the aromatic fluid extract, given in the dose of 30 minims to 1 drachm at night, or in other cases, in which constipation is obstinate, in the doses of 30 minims twice or thrice a day for one day or several days. Not rarely constipation is dependent upon atony of the lower bowel, and is due to deficient expulsive power, and in these cases the movement of the bowels is best produced by the use of an enema. Indeed, in my experience, this is the best way of overcoming most of the constipation met with. Saline purges are, as a rule, too depleting to be used in most cases.

For diarrhea, the rule I follow is that it is not to be arrested unless the patient has more than three movements a day, or unless these three movements seem to be weakening him. Under these circumstances the following mixture has proved of service for this purpose.

℞ Acid. sulphuric. aromatic., f℥j.
Extract. hæmatoxylin. fluid., f℥ ss.
Spirit. chloroformi, f℥ ss.
Syr. zingiberis, q. s. ad f℥iij.
Two teaspoonfuls every two to four hours.

If the diarrhea is very marked and weakness is also present, spirit of champhor is an efficient and most useful agent added to this mixture, and, if need be, small doses of morphine may be used, particularly if, sleeplessness is present.

All cases of typhoid fever should have the mouth well cleansed at least twice a day, as by this means much discomfort and middle-ear

infection and erysipelas are avoided. Ordinary tooth-wash or antiseptic washes may be used according to the degree of illness. It is of the utmost importance that the skin of the patient should be kept clean and the pores free, that it may eliminate from the body as much impurity as possible, so that bedsores may be prevented from forming.

Finally, we come to that much mooted question as to what shall be done in the way of treating the fever itself. Without doubt, cases occur in which the fever is so mild that it practically needs no antipyretic measures. Indeed cases are on record in which no fever has been present. Nevertheless, the great majority of cases do need some measure which will lower the temperature, and there are two general means of doing this. First, by the use of antipyretic drugs. The writer believes that in nearly all, if not all cases the use of any one or any combination of these drugs is deleterious in that they do harm in themselves. They mask the real progress of the malady, and so deceive the physician, and prevent the patient from receiving the beneficial effects of cold bathing. Many years ago it was the effort of physicians to reduce fevers by diaphoresis and diuresis, and they often succeeded in aborting febrile movement or aiding in its arrest or fall by measures too often to-day considered homely and useless. The fact remains, however, that whether they succeeded or not in relieving fever, they did no harm; and if the fever was severe enough to resist their measures the patient remained equally able to resist the onset of the infection producing it. The trouble, if preventable, was set aside; and if not, its true course and the object of its existence were not masked by powerful drugs. Further than this, two admirable results were obtained, namely, that the skin and kidneys were flushed, cleansed, and made ready for the task of eliminating materials which we to-day call "toxins," and any poisonous material already formed in the tissues or bowels was gotten rid of. Unfortunately for the profession, it was discovered that digitalis sometimes reduced fever; and as this symptom was often the most manifest and annoying, this drug began to be used for the reduction of temperature, and with it quinine began to take a valued place on account of its antipyretic and specific effect in malarial fevers. It was the fact that quinine was futile during the early stages of all fevers not malarial that roused the desire for something more active, and the nearness of the period of ridiculous fear of exposure to cold in fevers excluded cold applications from the therapy of such cases. As a result salicylic acid was employed, and from this it was but a step to the common antipyretics of to-day.

There is, however, abundant evidence to show that the older methods of reducing fever in mild infectious cases by the production of sweating and increased glandular secretion all over the body had

a far more rational basis than has the employment of antipyretic drugs, and that fevers which they failed to abort ran their course in many cases to the distinct benefit of the patient; further, that antipyretic drugs in reducing fever decrease the vital resistance of the patient, and that the use of the cold bath or cold sponging as employed to-day *does not do good by the reduction of temperature so much as by increasing glandular and other vital activities.* Bearing in mind the four methods of Nature for the protection of the body, namely, elimination of poison by the emunctories, the development of antitoxin by the glands and other tissues, the possible production of fever to stimulate and support the system and as a result the increased functional activity, and the development of leucocytosis —we can now go still further and show that the use of antipyretic measures is only to be resorted to in cases in which the fever is excessive, and that, if employed, only those are to be used which reduce the fever moderately and either increase the ability of the system to antagonize the infection or at least do not hinder it from doing so.

For these last reasons I believe that antipyretic drugs should very rarely be used for the purpose of reducing fever, for they not only remove fever, but at the same time depress the nervous centers governing heat-production, and increase the work of the emunctories already loaded down by the poison brought to them for elimination; and, more important than all to those who believe in phagocytosis, they arrest the development of leucocytosis and thereby remove one of the means of destroying the germs of disease (according to one theory) or of developing antitoxin (according to another). I am well aware that there is contradictory evidence in regard to the view that coal-tar products inhibit leucocytosis; but I believe that any evidence against my statement can be set aside in view of the fact that moderate variations in the number of leucocytes take place with or without the effect of drugs or infection. Further than this, authorities can be quoted showing that the use of antipyretic drugs increases the fatal tendency of an infection.

The studies of Jacubowitsch, Muller, and others prove very conclusively that antipyrin at least greatly decreases the elimination of urea by the urine; and the first-named writer vehemently condemns its use for this reason. It also decreases urinary flow, which is a distinctly harmful effect when we wish the excretion of effete materials from the body. The drug antipyretics greatly decrease the elimination of toxic materials by the bowel. Roque and Weill have shown that in the ordinary typhoid fever patient the elimination of toxins is greatly increased, whereas if antipyrine is given it falls even below the quantity excreted in health. On the other hand, the use of cold bathing greatly increases the elimination of toxins far above the quan-

tities naturally excreted. Again, antipyrin tends to interfere with the poison-destroying function of the liver by congesting it, for, as pointed out by Baruch, the weight of the liver after death from infectious disease treated by antipyretics is found to be ten to twelve grammes heavier than in those dying of typhoid fever treated by cold-baths. Porter asserts that these antipyretics in the presence of fever may cause granular and fatty degeneration in the kidney and liver. These experimental facts seem well founded upon clinical results, for under this method of treatment the mortality of infectious diseases has been as high or higher than when antipyretics, as we call them, were practically unknown; the death-rate from typhoid fever, for example, under antipyrin or similar treatment being about 10 to 15 per cent., while in cases treated by the cold bath it is from 1 to 7 per cent. as a rule.

The natural thought is that if antipyresis is harmful when obtained by drugs it is also harmful when obtained by cold baths. Yet clinical results prove the contrary. The fact that cold bathing does decrease the mortality of typhoid in the general run of cases is established, and it is not credible that the mere abstraction of heat can influence the progress of so grave a disease. I have long felt that the cold bath did more than abstract the heat, and I venture to advance the idea that it does so by permitting the tissues to destroy the poison of the disease by oxidation or allied processes. By the use of antipyretic drugs we prevent fever by decreasing the production of heat, and thereby inhibit oxidation processes in those tissues which develop the most heat and destroy the greater part of the infecting poison, be it microbic or toxic from the growth of germs. That is, we prevent the body from performing the protective work which it would do under the sole guidance of Nature. On the other hand, if the bath be employed, we actually increase the temperature of the internal organs, as shown by Liebermeister, who found that the internal temperature of the body was raised by the use of cold externally, and the more the cold the greater the rise. Foster also points out that when the naked body is exposed to cold for a short time the internal temperature rises. The reason of this seems to be the blood seeks the centers, and the central organs immediately produce more heat to make up for the loss at the periphery. Therefore, the cold bath really increases the destruction of toxin if I am right in believing that heat does aid in combating infection. The cold bath abstracts heat; and if used in moderation, as it is when properly employed, in all fevers actually increases bodily metabolism or tissue interchange, and consequently acts in much the same manner that an increased draught increases and makes more perfect the combustion of coal in a stove.

Liebermeister, Rohrig, and Zuntz have also shown that the use of cold applied externally increases oxidation in the body, so that a larger amount of oxygen is taken up and more CO_2 eliminated; and the experiments of Thermes show that cold bathing increases the number of the blood-corpuscles and the amount of their hæmoglobin. Winternitz has confirmed this observation. The differences in the effect of the antipyretic drug and the bath are notable. Thus, if we consider the body as a stove, and the tissues producing heat as the coal, and the coal to be mixed with impurities which can only be destroyed by oxidation, we can illustrate the effects of antipyretic drugs and baths very well. The object is to prevent the stove from being injured by overheating, and yet to destroy the poisons in the coal by heat. If the fire in the coal is smothered by antipyretics, so that less heat is produced, the stove (or the body) is in no danger of injury by heat; but the impurities mixed with the coal are also left intact and do injury; whereas if the coal is allowed to actively burn, and the stove kept moderately cool by the use of water or ice placed around it, the impurities are destroyed, and the usefulness of fever is attained without damage from excessive heat.

We come then, finally, to consider the exact value of the use of cold in fever, and in this connection are brought face to face with the question as to the exact value of the cold bath. I wish it understood that I am an advocate of the immersion or plunge bath in suitable cases and of the modified bath in all cases of typhoid fever. And I also wish it understood that I am opposed most strongly to the indiscriminate application of the cold plunge or Brand bath to every patient suffering from this malady. Two years ago I discussed this subject exhaustively before the College of Physicians of Philadelphia, with the aid of one of my assistants, C. A. Holder, who kindly aided me by the collection of much of the following valuable statistical information.

When we attempt to study this subject in order to determine exactly how valuable the Brand bath is we are met by the statement that the mortality, which was at one time no less than 25 per cent., can be reduced by the cold bath to from 10 to 7 per cent. As a matter of fact, a mortality of 25 per cent. has not been commonly met with for many years, and the largest body of statistics yet collected giving this death-rate are those made in Germany and France many years ago, when the disease was particularly virulent, when only severe cases were recognized and classified; and further, when owing to what may be called barbarous treatment the patients who survived fought their way against infection and treatment. Further, hospital facilities were comparatively poor, nursing ineffective, and sanitation wretched.

That severe cases chiefly entered into these statistics is proved by

the statements of Griesinger and Strümpel, who point out that numerous light and rudimentary attacks (typhus levissimus) were not recognized till lately as belonging to typhoid fever at all.

That the treatment was calculated to increase the mortality is shown by Vogl's statement that it consisted in venesection, emesis, and catharsis, and free use of mercury. That the hospital facilities were wretched in many instances as compared to those of to-day is notorious,[1] and the history of individual cases and the results of the analysis of large bodies of statistics impress upon us the important fact that among the poor who have not hospital care, and in armies where the patients are not cared for when in the field as is possible when at home, the death-rate is very high and the signs of disease severe.

Improvement in sanitation has decreased the frequency and mortality of this disease remarkably, as is shown by statistics.

Mosny has shown that the death-rate of Vienna decreased from 12.05 per 10,000 to 1.1 after a pure water-supply. In Dantzic the mortality has fallen from 10 per 10,000 to 2.4, and finally to 1.5 per 10,000. In Stockholm it has fallen from 5.1 in 1877 to 1.7 in 1887. So, too, in Boston from 17.4 in 1846–49 to 5.6 in 1870–84.

The following table is of interest in this connection:

MORTALITY IN MUNICH FROM 1851 TO 1873.

Year.	Inhabitants.	Annual.	Per 1,000,000 Inhabitants.	Year.	Inhabitants.	Annual.	Per 1,000,000 Inhabitants.
1851	123,957	123	99.0	1874	181,300	289	159.0
1852	125,588	152	121.0	1875	187,200	227	121.0
1853	127,219	235	184.0	1876	193,024	130	67.0
1854	128,850	293	227.0	1877	205,000	173	84.0
1855	130,481	253	193.0	1878	211,300	116	55.0
1856	132,112	384	291.0	1879	217,400	236	109.0
1857	133,847	390	291.0	**1880**	223,700	160	72.0
1858	135,733	453	334.0	1881	230,028	41	18.0
1859	137,005	240	175.0	1882	236,400	42	18.0
1860	140,624	153	109.0	1883	242,800	45	19.0
1861	144,334	172	119.0	1884	249,200	34	14.0
1862	148,200	300	202.0	1885	255,600	45	18.0
1863	154,602	252	163.0	1886	262,000	55	21.0
1864	160,828	397	247.0	1887	268,400	28	10.0
1865	167,054	338	202.0	1888[2]	292,800	31	10.5
1866	168,265	342	203.0	1889	306,000	31	10.1
1867	169,476	88	52.0	**1890**	331,000	28	8.5
1868	170,688	136	80.0	1891	357,000	24	6.4
1869	170,000	190	111.0	1892	372,000	11	3.0
1870	170,000	254	149.0	1893	385,000	57	14.8
1871	170,000	220	129.0	1894	393,000	10	2.5
1872	169,693	407	240.0	1895	400,000	15	3.7
1873	175,500	230	131.1	1896	412,000	14	3.4

[1] See Baas, *History of Medicine.*

[2] This table is taken from Pettenkofer's *Munich a Healthy City* up to 1887 inclusive; after 1887 from returns obtained from the Statistical Bureau.

The effect of improved sanitation is to decrease the virulency of infection, and for this reason there follows a decreased severity of illness and a decreased percentage of mortality.

For these reasons then we shall exclude the statistics of 1840, 1850, and 1860 from comparison and confine ourselves to more recent statistics more suitable for this purpose. This is the more important when we discover that the frequency, severity, and mortality of typhoid fever are steadily decreasing all over the world, as is shown by the following interesting tables of Dreschfeld in regard to England in general and London and Manchester in particular:

ANNUAL MORTALITY, PER MILLION PERSONS LIVING, FROM FEVER IN ENGLAND.

Period.	Enteric Cases.	Period.	Enteric Cases.	Period.	Enteric Cases.	Period.	Enteric Cases.
1838	1228	1852	1022	1866	986	1880	261
1839	1010	1853	1008	1867	778	1881	212
1840	1089	1854	1015	1868	895	1882	229
1841	932	1855	875	1869	390	1883	228
1842	1004	1856	847	1870	388	1884	236
1843		1857	988	1871	371	1885	175
1844		1858	918	1872	377	1886	184
1845		1859	806	1873	376	1887	185
1846		1860	652	1874	374	1888	172
1847	1807	1861	767	1875	371	1889	176
1848	1266	1862	919	1876	309	1890	179
1849	1044	1863	874	1877	279	1891	168
1850	865	1864	960	1878	306	1892	137
1851	997	1865	1089	1879	231		

DEATH-RATE FROM ENTERIC FEVER IN LONDON AND MANCHESTER PER 1,000,000.

1871	267	450	1883	247	200
1872	242	400	1884	234	190
1873	269	460	1885	150	170
1874	256	390	1886	154	290
1875	235	440	1887	151	310
1876	217	420	1888	169	330
1877	151	290	1889	130	310
1878	283	310	1890	146	270
1879	229	180	1891	132	370
1880	186	260	1892	102	240
1881	254	170	1893	161	250
1882	252	250			

Not only is the decrease in mortality seen in England, but in Philadelphia and New York, as follows:

PHILADELPHIA.[1]

Year.	Cases.	Deaths.	Per cent. of mortality.
1888	3573	785	21.9
1889	4631	736	15.8
1890	3182	566	20.9
1891	3531	683	19.3
1892	2304	440	17.1
1893	2519	456	18.1
1894	2357	370	15.7
1895	2748	469	17.0
1896	2490	402	16.1
1897	2994	401	13.3
1898	6097	639	10.48
1899	7885	948	11.87

[1] These statistics go back as far the comparative records extend.

The great increase in the number of cases in 1898 in Philadelphia was in large part due to the soldiers who returned from the Spanish war, and who started an epidemic which lasted during the year 1899. The mortality rate nevertheless decreased as compared to the preceding years.

NEW YORK.

Year.	Cases.	Deaths.	Year.	Cases.	Deaths.
1888	1108	364	1894	792	326
1889	1414	397	1895	965	322
1890	1100	352	1896	1002	297
1891	1342	384	1897	1004	299
1892	1140	400	1898	2226	676
1893	1008	381	1899	1950	546

A great increase in frequency has also been present in New York during the past two years, probably due to the same cause, but the mortality rate is about the same. The mortality rate of New York is far greater, however, than that of Philadelphia.

When we consider that the population of these cities has increased enormously the great decrease in the death-rate is very notable.

These tables are supported by the statement of Billings that in Norway from 1888 to 1891 the mortality from typhoid fever was 755 in 7467 cases, or less than 10 per cent. In the recent Maidstone epidemic the death-rate in 1885 cases was only 7.5 per cent., and a similar mortality obtained at Plymouth, Pa. Again, in the *Gazette médicale des Hôpitaux* of July 10, 1890, we learn that a collective investigation showed that whereas in the period from 1866 to 1881 the mortality from typhoid was 21.5 per cent., from 1882 to 1888 it was 14.1 per cent.; in 1889, 13.5 per cent.

It is evident therefore that the mortality to-day should be placed at less than 15 per cent. as a fair percentage, the more so as many years ago Murchison placed it at 17.45 among 27,951 cases in England.

Assuming, then, that the ordinary mortality of typhoid fever is at present about 15 per cent., the question arises, How much credit is to be given to the cold plunge bath method for the reduction, claimed by its advocates to be about 7 or 8 per cent.? It is well in this connection for us to remember that a disease that cannot be aborted and which runs a definite course till it is completed, will do less damage to the patient if the case is guided through the storm so that his natural processes are not perverted, than if by meddlesome or absolutely harmful treatment his organs, already bearing the burden of disease, are still further strained by the influence of unnecessary drugs and by the necessity of absorbing and eliminating them.

The best treatment for typhoid fever is to let drugs alone so far as possible. It is evident, therefore, that if a given routine is followed which is manifestly not incorrect in its fundamental details, better results will be obtained than if each physician steers his patient on a course of his own choosing, which may not only be useless but actually dangerous.

This is shown by the facts presented by Liebermeister in his well-known article in Ziemmsen's *Cyclopedia* in which he gives carefully prepared tables of 839 cases, of which 377 were treated non-specifically, with a mortality of 18.3 per cent.; 223 treated by full doses of calomel, with a mortality of 11.7 per cent.; and 239 with iodine, with a mortality of 14.6 per cent. If the grave cases are included in his statistics the mortality of a general plan of treatment was 25.3, those treated with calomel 16.3, and with iodine 17.2 per cent. A routine treatment here gave a saving of life nearly as great as the cold bath treatment often does, namely, the difference between 15 and 7 per cent. Liebermeister adds that he has compared 50 cases treated with calomel, 50 with iodine, and 50 by general indefinite measures, selecting those admitted about the same time and all of whom were looked upon as grave cases in their early history. All the calomel cases recovered, and yet he rejected all cases which did not reach an axillary temperature of 104° F. or over.

Bouchard with intestinal antisepsis, quinine, cool bathing, etc., had a mortality of 11.16 per cent. as against 21 per cent. on the old general plan of treatment; while Mason records 676 cases with a mortality of 10 per cent. under cool sponging, intestinal antisepsis in some instances, and symptomatic treatment. Under a similar plan Jaccoud lost out of 655 cases 10.8 per cent. Riess in 900 cases with the use of tepid baths had a mortality of 7 to 8 per cent., and under pure expectant treatment with plenty of water to drink Debove had at the Hôpital Andral 9.2 per cent. (See also Collie's statistics about to be quoted.)

Of very great interest in this connection are the results recorded by A. L. Mason in the *Boston Medical and Surgical Journal* of April 14, 1892. During 1890–91 there were treated in the Boston City Hospital 676 cases of typhoid fever, of which 75 were fatal, or 10.4 per cent. This includes all cases—mild, moribund, or doubtful—which entered the house. To illustrate how statistics may mislead Mason records five different series of cases, aggregating 242 cases, with 5 deaths, or a mortality of about 2 per cent. The treatment consisted not in the Brand method, but in sponging and affusions, the use of antipyretic drugs, antiseptics, and tonics.

The following table contains a large number of cases treated without baths:

	Cases.	Per cent. of Mortality.	Treatment.
Basel (Liebermeister)	223	11.7	Calomel.
Basel (Liebermeister)	239	14.6	Iodine.
Maidstone, England	1,885	7.5	General.
Boston (Mason)	676	10.4	General.
Homerton (Collie)	677	9.5	General.
Glasgow (Collie)	618	8.2	General.
Société Médicale des Hôpitaux (1879)[1]	1,979	12.47	
Jaccoud	665	10.8	General.
Riess	900	7.5	Tepid baths.
Boston (Shattuck)	237	9.8	Expectantly and cold sponging.
Germany (?) Brand has collected	19,017	7.8	All kinds of cold baths.
	27,116	10.02	

In other words, 27,116 cases in Switzerland, America, England, Germany, and France show that good nursing and careful non-meddlesome treatment will give a mortality of about 10 per cent. It may be argued that these cases cannot be compared with cold plunge bath methods, but the wide distribution of the cases and the large number of clinicians certainly give us what may be called a standard average. The reduction in mortality to 10 per cent. is, therefore, due to good nursing and treatment, and the further reduction to 7.5 per cent. claimed by Brand advocates only amounts to about 2.5 per cent.

Admitting, then, that a harmless form of treatment with careful nursing naturally modifies typhoid fever, these factors must be deducted from the credit given to the cold bath of Brand (which gives 7.5 per cent.) before we can reach real facts as to the value of this plan *per se*, for in it careful nursing is a *sine qua non* to its use, and only such medication is resorted to as is needed to control symptoms or accidents. Again, one other factor is not to be ignored, namely, that it is an almost universal practice to use alcohol in the cold plunge bath treatment; and this stimulation, often repeated many times a day, by means of a drug which lends force to the system, is to be credited with some effect. To emphasize still more the fact that good nursing and treatment modify the mortality without the plunge bath, we can quote the figures of Collie comparing the death-rate in Basel with that elsewhere in the same years with and without the bath.

At Basel, in 1873, under the cold bath, there were 163 cases with a mortality of 10.4 per cent.; during the same year at Glasgow, without baths, 275 cases, with a mortality of 9.4 per cent.; and 305 at

[1] These statistics are based upon the fact that twenty-one chiefs of hospital service reported to the Société Médicale des Hôpitaux (1890) 916 cases with 114 deaths, or 12.44 per cent., under general treatment; and for 1888 this report also mentions 1063 cases so treated with 133 deaths, or 12.51 per cent.

Homerton, with a mortality of 9.5 per cent. In 1874 at Basel the water cases were 200, with a mortality of 9.6 per cent.; at Homerton, 372, with a mortality of 9.6 per cent.; at Glasgow, 343, with a mortality of 7 per cent. As Collie well points out, it is likely that the cases in Glasgow, with 500,000 population, and East London, with 1,000,000, would be more severe than in Basel, a country town of 40,000 to 50,000 people.

Table Showing that the Mortality under General Treatment may be as Low as under Bath Treatment.

	Number of Cases.	Treatment.	Mortality Per cent.
Basel (1873)	163	Bath.	10.4
Glasgow (1873)	275	General.	9.4
Homerton (1873)	305	General.	9.5
Basel (1874)	200	Bath.	10.5
Glasgow (1874)	343	General.	7
Homerton (1874)	372	General.	9.6

Before determining the value of a method of treatment from statistics derived from hospital practise it is necessary to ascertain the death-rate outside of that hospital and, if possible, for the entire city or surrounding country.

In this connection it is interesting to note that in J. C. Wilson's cases, recorded with great detail to the number of 108 as occurring in the German hospital from June 1, 1893, to October 1, 1894, and submitted to the most rigid type of plunge bath treatment, the mortality reached 11.1 per cent., and that for the same two years—1893–94—the mortality in the whole city of Philadelphia, including every type of case and every plan of treatment, or none at all, was only 16.8; or, in other words, the mortality of the plunge bath treatment was only 5.7 per cent. less than that of the whole town. Again, in the series of cases which he has had since that time (October 1, 1894, to January 1, 1896), namely 117, he had 19 deaths, or a mortality of 16.25 per cent., whereas for the whole city of Philadelphia the mortality was only about 15.3 per cent. In 1898 Wilson's cases to the number of 209 had 20 deaths, a mortality of 9.57 per cent., while the mortality of Philadelphia was 10.48 per cent.; and in 1899, out of 267 cases 26 died, a mortality of 9.73 per cent., as against 11.87 per cent. for the entire city of Philadelphia. Allowing for the fact that Wilson excluded from his cases patients who were admitted moribund, and that all of them were under the most approved and complete nursing and in the hands of competent resident physicians and a physician-in-chief of wide experience, it does not seem to me that the plunge bath treatment has really given in this instance a very great degree of life-

saving; and it must be recalled that while the percentage of deaths named by Wilson was a percentage derived from all (with the exceptions noted) cases in the wards, the percentage of mortality for the city was really far less than it would seem, for many physicians neglect to report cases unless they grow so ill that it is done at once before the death-certificate has to be signed.

Considering the fact that patients are supposed to be greatly benefited by this treatment, if treated before the fifth day, it is a curious fact that out of 14 of Wilson's cases (in 108) which received the plunge bath by the fifth day no less than 4 died, and another case died which is stated as admitted early in the disease. It is also an interesting fact that while the general mortality of Philadelphia was decreasing progressively in 1890, 1891, 1892, 1893, and 1894 from 20.3 to 15.7 per cent., that Wilson's statistics should have an increasing mortality from 1.8 in 1890 to 11.1 per cent. in 1894, and 16.25 in 1894 to 1896. Owing to imperfect health reports we cannot discover the percentage of typhoid mortality in Baltimore to compare with Osler's cases.

The same difficulty exists in New York in regard to Gilman Thompson's and the city statistics. At the Philadelphia Hospital the practise of tubbing was not instituted till 1892. How rigidly it has been enforced we have not been able to determine, but it is evident that the mortality has not been materially influenced by this means. Thus, 1888, 1889, and 1890 had a mortality without the bath identical with that after the bath was used in 1895, 1896, and 1897; and 1888, 1889, and 1890 had a mortality lower than 1892 and 1893 when the bath was used. We think, therefore, that it may be considered proved that a large credit should be given to other causes than the Brand bath; and this holds true not only for this country, but abroad, for most of Brand's statistics are derived from German military hospitals in times of peace, when everything tends to a mild course of the disease. The military sanitation, the close watch over each individual, the fact that the chance to earn a livelihood is not lost if the patient goes to bed early, all tend to render the disease mild and to cause cases to come under treatment early. Further, the patients are in the great majority of cases very young, just passing out of their teens. It is evident, therefore, that the cold plunge bath in *itself* is not as useful as would appear at first sight.

There are certain objections to the cold plunge bath in the sense of tubbing which must be met. The first of these is that by its use an unnecessary expenditure of the patient's strength ensues. No one can see for the first time a typhoid fever patient bathed without a feeling of mingled pity for the case and mistrust for the method. To use Osler's clever words: "When I hear a poor fellow (who has been

dumped, like Falstaff, 'hissing hot' into a cool tub) chattering out maledictions upon nurses and doctors, I am inclined to resent it, and to pray for a method which may be, while equally life-saving, to put it mildly, less disagreeable." So much for sentiment and perhaps judgment. Let us see if there are other rational objections.

To remove a patient too feeble to raise his hand to his head into a tub of water some 35° F. colder than his body, which is accustomed to the heat of his bed, seems heroic, and the lifting and necessary handling must produce some loss of needed strength. Again, the shock of sudden and complete immersion may or may not be harmful, according to opinion; but the nervous awakening, if really a good thing, can hardly be looked upon without the thought that the nervous energy expended is unnecessarily great, and one wonders whether the same results for good could not be obtained by gentler measures. That they cannot remains to be proved. When it comes to permitting a patient to rise from his bed and step into the tub, then we believe the enthusiasm of the bath advocate oversteps the limits of good sense. Nothing can possibly be gained by this expenditure of strength and its strain on a heart taxed by fever, exhaustion, and toxæmia. Even if strong enough at the time, the patient should save such energy for some future crisis or to aid in his convalescence. If walking typhoid has a high mortality, it is due to this lack of conservation of energy. It seems to us as unwise for a patient to arise and step into a tub with a possibly ulcerated artery in a Peyer's patch as for a case of aneurism to make any effort. The shock and altered circulation are sufficient strain on the blood-vessel without the additional strain of change of posture and of effort.

Thus Liebermeister says, although an ardent bath advocate: "It is possible that the determination of blood to the internal organs, caused by the abstraction of heat, may increase the *tendency to hemorrhage; and, at all events, the moving of the body, be it active or passive, connected with the taking of a bath, is injurious.* The same thing, of course, holds true, to a still greater degree, in perforation of the bowels."

Hemorrhages.—The frequency with which hemorrhages occur varies greatly in different epidemics independent of any specific line of treatment over and above rest in bed. Lack of such rest certainly predisposes the patient to this accident. In 861 cases of this disease without the cold bath in Liebermeister's clinic, at Basel, hemorrhages occurred 72 times, or in 8.4 per cent. Griesinger met with 32 cases in 600, or in 5.3 per cent.; and Louis found them in 5.9 per cent., excluding mild cases. The younger Wunderlich has recorded 98 cases of typhoid fever without the bath, with hemorrhage in 2 cases, or about 2 per cent. We find, therefore, that in 1559 cases treated

without the cold bath there were 99 hemorrhagic cases, or 5.2 per cent.

On the other hand, we find that in bathed patients Wunderlich, Jr., records 155 cases, with 16 hemorrhagic patients, or 10.3 per cent.; Immermann, at Basel, records 146 cases, with 6 hemorrhages, or 4.1 per cent.; and Liebermeister, 882 cases, with 55 hemorrhages—1183 cases, or 6.8 per cent.

This is shown by the following table:

WITHOUT BATH.

	Cases.	Hemorrhages.	Per cent.
Liebermeister	861	72	8.4
Griesinger	600	32	5.3
Wunderlich, Jr.	98	2	2
Totals	1559	106	5.2

WITH BATH.

	Cases.	Hemorrhages.	Per cent.
Liebermeister	882	55	6.2
Immermann	146	6	4.1
Wunderlich, Jr.	155	16	10.3
Totals	1183	77	6.8

To these may be added: In America, with baths, Wilson's 140 cases, with 10 hemorrhages, or 7 per cent.; Osler's 356 cases, with 12 hemorrhages, or 3.4 per cent. In 1898, Wilson reported 209 cases with hemorrhages in 20, or 9.57 per cent.; and in 1899, 267 cases with 19 hemorrhage cases, or over 7 per cent.

It is interesting to note in this connection that Fitz places the general frequency at 5 per cent., and Loomis at 5 per cent. It is, however, only fair to state that Goltdammer, from nearly 20,000 cases, concludes that the bath does not increase hemorrhages. Brand claims they are less frequent, as do also Tripier and Bouveret; but Roland G. Curtin tells us that upon investigation he found that since the cold-water treatment has been instituted the number of hemorrhagic cases has considerably increased, according to the hospital records that furnish the data, and, in addition, the mortality of the hemorrhagic cases is largely increased, viz., from 5 in 17, less than one-half, to 25 in 43 cases, or over one-half; and further, on inquiry, he found that in two of his tabulated cases the hemorrhage seemingly took place while the patient was in a bath, and in one case immediately after a bath.

The fact that hemorrhage is one of the chief causes of death in typhoid fever is not to be forgotten.

Relapses.—It is admitted by advocates of Brand's method that relapses are more common under its use than without it. Osler met with 14 cases of relapse in 160 cases bathed, or 8.7 per cent., but mentions 5 other cases of doubtful relapse, which raises the percentage; while Shattuck met with 21 in 129 cases, or 16 per cent., and 11 occurred before primary fever ceased. Wilson tells us that it occurred in from 8.24 to 11.5 per cent. of his cases, and Osler tells us 8.7 per cent.; Shattuck, 16 per cent.; Immerman, 15 to 18 per cent.; Baumler, 11 per cent.; and Jaccoud, 9 per cent., varying from 1 to 15 per cent. As against this we may place the frequency as given under no bath treatment. Thus, Murchison gives it at 3 per cent.; Gerhardt, in 4000 cases, 6.3 per cent.; Griesinger puts it at 6 per cent., and Strümpel at 4 to 16 per cent.[1]

At the Presbyterian Hospital, in New York, Gilman Thompson found the relapses in 193 cases to be 13.5 per cent., which is 2 per cent. higher than in 284 cases treated by all methods during the same time.

Liebermeister says: "In Basel, before the introduction of this treatment, 861 typhoid fever patients gave us 64 relapses, or 7.4 per cent., 2 of which were fatal; after the introduction of this treatment, 882 typhoid fever patients gave 86 relapses, or 9.8 per cent., 10 of which proved fatal. *It appears, therefore, that the proportion of relapses and the number of deaths are both actually increased under the use of cold water.*" And discussing the probable bearing of these results, he adds: "At present the probability certainly seems to be in favor of the affirmative of the question, the more so as it appears that the frequency of relapses is greater in proportion as the antipyretic treatment has been the more systematically employed." Biermer has also found relapses more frequent since the introduction of cold plunge baths. On the other hand, Murchison, with his extraordinary opportunities, places the percentage of relapses at 3 per cent.[2]

Having determined the fact that relapses are more common under the cold plunge bath, we must determine what are the dangers of a relapse. As a rule we believe relapses are milder than the primary attack, provided the primary attack has been severe.[3] On the other hand, if it has been rudimentary or in the class called by some writers

[1] It is not possible for me to discover if all the cases of Gerhardt and Griesinger were treated without the plunge bath.

[2] It is interesting to note in this connection that in twenty-five of Wilson's cases in which the bath was commenced within the first week there were no less than four relapses.

[3] Flint is the only author of note who thinks that the relapses are more severe than the first attack.

"typhus levissimus," then the relapse is more severe. In any event the relapses are characterized by a greater suddenness of onset and usually a shorter course. That the relapse is an element of danger seems self-evident, since it comes on in a patient already exhausted by disease. Therefore the prognosis is grave according to the severity of the relapse and the state of the patient. It is interesting to note that in Liebermeister's cases out of 111 cases of simple relapse the fever was longer in duration than in the first attack in 37, shorter in 68, and of the same length in 2. In 29 of the cases the primary attack was mild and in 82 severe, but the relapses were mild in 47 and severe in 64, and 7 of these died in the relapse.

Other figures might be stated, but these seem sufficient to prove that relapses are dangerous to the patient and to be avoided if possible. This is still further emphasized by the fact that at Basel, out of 115 relapses, hemorrhage from the bowel occurred four times, perforation twice, thrombosis once, pulmonary consolidation nine times, nose-bleed seven times, bed-sores four times, abscesses five times, and petechiæ three times.

To quote Liebermeister again: "If we take the reports of the years 1869, 1870, and 1872, at Basel, we find, among 467 typhoid fever patients systematically treated with cold baths, 33 deaths and 55 relapses, 6 of which were fatal; the frequency of relapses, therefore, counting only those patients who had survived the first attack, was in the proportion of 12.5 per cent., as against 9 per cent. before baths were used. The higher rate of mortality among the relapses is of so much the greater import, in view of the fact that the relapses, too, were treated antipyretically, which ought rather to have given us a lower death-rate."

Perforation.—An interesting question is the effect of baths on intestinal perforation. What the ordinary percentage of this accident is is in some doubt, but according to Murchison it is in the neighborhood of 3 per cent., and this is about the percentage reached by Osler in cases bathed and not bathed.

The most interesting comparative statement as to the frequency of perforations with and without the bath is that made by Mason. Thus at Boston City Hospital the percentage of perforations in males was 1.4 and in females 1.3, while under the cold bath in Brisbane it was 3.6 per cent. in males and 1.6 per cent. in females—Liebermeister's statistics, viz., that there were 12 cases of this accident in 973 patients before the bath and 14 in 1108 after it was introduced, show a very slight difference.

The mortality of this accident is very high. Of 1721 autopsies the percentage was 11.3, according to Murchison. According to

Osler, it was found in 2000 Munich cases 114 times (5.7 per cent.), and in 20 out of 80 of his deaths.

Duration of Disease.—The influence of the plunge bath treatment on the duration of the disease seems to be to prolong it. It is necessary to determine the ordinary duration with and without baths. Very important classifications of cases are those made by Liebermeister and Jurgensen. The first of these clinicians speaks of the mildest cases as those in which the rectal temperature never or rarely rises above 103° F., and the duration of fever does not exceed eight days. Such cases require only dietetic treatment and cannot be used to show the value of different modes of treatment. The mild cases do not have a rectal temperature above 104.8° F., and the fever lasts sixteen days. The severe cases are those in which the rectal temperature rises above 105° F. and the fever ceases by the twenty-first day. Jurgensen considers all cases mild which have no fever after the tenth day, and those severe that have fever after this date.

Murchison states the mean duration in 75 cases to be a fraction more than twenty-four days. Flint states from going to bed to normal temperature sixteen days, with a maximum of twenty-eight days and a minimum of five days. Longest case seen by Flint was fifty-eight days.

Of forty-five of Flint's fatal cases the duration was a fraction more than fourteen days. Murchison tells us that the mean stay in hospital of 500 cases which recovered was 31.24 days; of 100 fatal cases, 16.52; while the average duration of illness before admission of the 600 cases was 10.78 days. Again, Murchison tells us that the pyrexia, as a rule, lasts at least three weeks, and the ordinary duration of enteric fever is from three to four weeks. Of 200 cases which recovered, and in which he was able to fix the commencement with tolerable certainty, the duration was: ten to fourteen days in 7 cases; fifteen to twenty-one days in 49 cases; twenty-two to twenty-eight days in 111 cases; twenty-nine to thirty-five days in 33 cases.

The mean duration of the 200 cases was 24.3 days; and the mean duration of 112 other cases, which were fatal, was 27.67 days.

The average duration of residence in St. Thomas' Hospital, London, in 1894, 1895, and 1896 was from 43.1 to 51.8 days, and the average duration of fever from 14.3 to 16.73 days, although a great proportion of the patients were admitted in the first or second week.

If we take the 25 cases admitted in the first week of the disease, given in Wilson's table, we find that the average stay of these patients in the house was forty-one days ($40\frac{8}{9}$), and the average day of normal temperature the nineteenth. The average maximum temperature was 104.6° F. (40.3 C.). If the entire 108 given in his last

table in his article are studied we find that the average duration of the fever was: in the cases admitted in the second week, 23.2 days; in the third week, 27.3 days; and the average stay in the house of the second-week cases, 40.8; and of the third-week cases, 38.8 days. These figures would seem to contradict Wilson's statement that his patients, as a rule, return to their homes in two weeks from defervescence.

Gilman Thompson states emphatically that the cold bath does not ordinarily shorten the duration of the disease.

To summarize the points so far covered, we find that the mortality from typhoid fever to-day all over the world, except in the presence of individual epidemics of malignant infection, is not over 15 per cent., and if the cases receive good nursing and non-meddlesome treatment, about 10 per cent. or less.

That in American hospitals under the best men in the profession the mortality of typhoid fever is about 7.5 to 8 per cent., and sometimes 10 or even 18 per cent.; therefore, the saving of life by the bath is not the difference between 25 per cent. and 7 per cent., but between 10 per cent. and 7 per cent. at the very best.

That this method does not shorten the attack, but probably prolongs it.

That relapses are much more frequent under it.

That hemorrhages are more frequent, when in reality the modification of all the symptoms by the bath would lead us to expect a decrease in their number.

That the frequency of perforation is not decreased.

Finally, to quote Wilson's most recent paper,[1] "the (plunge-bath) treatment is attended by the occurrence of albuminuria in a large percentage of the cases. This albuminuria shows itself in two forms: (*a*) as a faint reaction without casts or other indications of renal disease; (*b*) cases in which albumin is present in considerable amounts with blood-corpuscles and casts. We have been led to believe that both these forms of albuminuria are much more common in cases treated by cold bathing than in those treated upon the expectant plan, and that the difference between the two forms is merely one of degree. Our observations, however, justify the assertion that in by far the largest proportion of the cases the albumin disappears from the urine during the course of the attack and that at the end of convalescence the urine is entirely normal. In a limited number of cases a history of previous disease of the kidney has been obtained, and in a very few instances patients who develop albuminuria during the attack have left the hospital with evidences of nephritis."

If the general mortality of 15 per cent., as we have shown, exists,

[1] *Philadelphia Medical Journal*, March 10, 1900.

is reduced to 10 per cent. by good nursing and treatment, and the mortality under the bath amounts to about 7.5 per cent. at the very best, as it does in the hands of all American observers, it is evident that the cold bath is responsible for a saving at the most of but 2.5 per cent.; and it is also evident that *this 2.5 per cent. is saved by the favorable effect of the bath on the nervous system, circulation, respiration, and the toxæmia, for the other cases of death remain unaltered in frequency or are increased.* That the saving of more than 2 per cent. of patients by this method is deserving of the greatest praise must be acknowledged, and it is *for this reason that cold bathing, in one form or another properly employed, should be used in nearly all cases.* The evidence so far adduced has been brought forward, not with the purpose of antagonizing the use of cold, but to show the exact value of the cold plunge bath; to give it all the credit it deserves, but not to permit an exaggerated view of its value.

With the manner in which these good effects are produced we shall deal a little further on. It yet remains for us to determine what are the defects of this method, then to consider how it does good, and, finally, whether any better plan or modification can be adduced.

In the first place, it would seem an opportune time to protest against the almost universal application of the plunge bath to this disease. It is, or ought to be, a fundamental law of therapeutics that there is no such thing as treatment by hard and fast rules of routine. The recommendation that all cases of typhoid fever with a temperature of 102° to 102.5° F. shall be placed in a tub of water at 65° to 70° F. is an affront to this rational law. Until all human beings are exactly alike in every attribute and characteristic and all micro-organisms are possessed of equal virulency, power of multiplication, and growth, every case of infectious disease seen by the physician will require careful study if the best results are to be obtained. *He must modify his treatment to fit his case.* It may be that some general trend of method is suited to all cases just as a coat is needed by all inhabitants of cold countries, but each individual needs a modification of the coat to fit his figure and necessities. Digitalis is useful in twenty-drop doses in many cases of valvular heart disease; it is useful in other cases in smaller doses, and in some not at all useful; and even a specific remedy, like quinine for malaria and mercury for syphilis, is subject to grave modifications in every case we meet if the best results are to be obtained.

It must be evident that as the temperature is far more easily reduced in one patient than in another, the temperature of the bath should be modified to suit the case as well as the duration of the bath. Every one knows how in one patient with a temperature of 104° F.

the temperature is easily lowered, while in another, because of the severity of the disease, an excess of fat, or other causes, the reduction can only be caused by great effort.

When we consider all the points in the cold plunge-bath treatment it is almost impossible to avoid the thought that it is a measure to which in a few years we will look back with the same distress that we regard excessive venesection and other excesses. We are now told to plunge practically every case of typhoid fever into a bath at 70° F.; to keep the man, shivering, chattering and blue, in the water for some twenty minutes, then to lift him out on a bed, place a hot bottle to his feet, and perhaps elsewhere, and give him a drink of whiskey to overcome his feebleness and chills. Truly he is cast from the heights of pyrexia to the degradation of collapse, and then with a swift turn stimulated to renewed febrile efforts. That the mortality is decreased by this method may be partly true, but to use a simile, are we not using croton oil to move the bowels in all cases when cascara sagrada will do equally well in a number, and the croton oil is required only in a few?

These facts have been recognized by so many eminent men of very large experience that it would seem unnecessary to quote them were it not that followers of the cold plunge-bath plan recommend its use in every case of the disease which comes to their hands. Thus we find one of the leaders in his enthusiasm for this method of treating this disease telling his readers that he has used it continuously for seven years, that it has been the "only treatment" in his wards, and that all patients suffering from this disease have been submitted to it except very rare cases in which the axillary temperature has not reached 101.5° F., those brought in in a dying state, and those admitted after the third week. He also stops the bath in the presence of hemorrhage and perforation. And again we are told that the patient receives a full bath at 65° to 70° F. every five hours when the rectal temperature reaches 102.2° F. or over. Other clinicians do likewise. On the other hand, we find no less an authority than Strümpel making the following statements:

"In so far as the height of the fever furnishes an indication for baths, we may accept, say, 103.6° F. (39.8° C.) in the rectum as the temperature calling for a bath. At night we have given baths very seldom, except when forced to by extremely high temperatures or other bad symptoms. It must be a mistake to wake a patient who is quietly sleeping, and put him into cold water, even if his temperature is above 104° F. (40° C.). Likewise, in cases where the temperature shows considerable spontaneous remissions, there may be no use in inflicting a cold bath upon a patient who has high fever only temporarily.

"It is not always advisable to use baths, however advantageous this treatment may be, in typhoid fever. There are a number of contraindications which cannot be disregarded, as great weakness or great sensitiveness, such that the excitement caused by the bath might do harm. Sometimes baths are followed by severe rheumatic ('rheumatoid') pains in the limbs, and often they seem to promote the occurrence of furunculosis. In such cases it is often necessary to omit the baths, or, at any rate, to employ them less often and at a warmer temperature. The same is true if a severe laryngeal affection develops, or otitis or nephritis. Nothing seems to us a greater mistake than to attempt to establish a scheme for the treatment of typhoid fever by baths that shall be always applicable. Here, if anywhere, the only correct way is to treat each individual case according to its special symptoms and circumstances."

Brand himself modifies the bath and states that he always uses warmer baths for twenty-four hours if the patient has been ill as long as four days, and his enthusiastic follower Baruch tells us that like all agents that are powerful for good this method may produce irreparable damage (Baruch, p. 42). The depressing effect of the bath has been noticed by Liebermeister, who considers a high degree of cardiac weakness an important contraindication. He also points out that some patients cannot bear a sufficient repetition of them, and that other contraindications may exist to their use.

Osler also tells us that the baths have often been changed to cold spongings on account of profound weakness, tenderness and swelling of abdomen, signs of perforation, and because of the active protestation of the patient. Out of 356 cases only 299 were bathed, showing that in Osler's view a large proportion of cases are not suited to the bath.

Finally, *the patient must be strong enough to react* and rally from the bath. As we shall show, all the good effects come from reaction; and Baruch points out that the bath which is of benefit in the first week may in the third prove a fatal depressant (p. 62), and a very feeble patient in the first or second week is quite apt to fail to react.

Loomis has well said: "There is no remedial agent which requires greater care and judgment in its use than the cold bath, yet doubtless, when judiciously employed, the lives of many typhoid patients may be saved, and it is equally certain that when injudiciously employed many lives may be destroyed. The general condition of the patient and the stage of the fever must be considered; also the effects of the first few baths must be carefully noted. Should a patient's temperature range at 104° or 105° F., it is no positive indication for the resort to a cold bath, or that a cold bath is the best agent to be employed for its reduction. If the patient after

the second or third bath is more quiet, has less delirium (if delirium previously existed), if his breathing becomes easy and natural, if the heart's action is more regular and forcible, and he falls asleep and perspires, there can be no question in regard to the beneficial effects of the bath. If, on the other hand, the bath is followed by feebler heart's action, by dusky cheeks, by rapid respiration, and by coldness of the extremities, from which condition the patient rallies slowly and imperfectly, it is certain that, however high the temperature may range, harm will be done by continuing the baths. When the extremities are cold, or there is profuse hemorrhage from the bowels, or when from any cause there is great feebleness of the heart's action, and especially in the case of aged persons, cold baths are contraindicated."

A large number of other authorities might be named, but we may quote Nothnagel, who asserts that when there is cardiac feebleness along with fever, and especially when profuse diarrhœa is present, cold baths should not be used.

These quotations and the reasons given show that it is unwise and unnecessary to bathe in a tub every case of typhoid fever. This treatment has its limitations just as all others have theirs.

It is said by the bath advocates that if mild cases are not bathed they may become grave afterward; but if this is a valid excuse then we should bathe patients with a practically normal temperature or one below that in which the bath is recommended. Personally we cannot believe in this view. On the other hand, we believe that in cases with little fever the good nursing, massage, proper feeding, sponging with friction, and care will be adequate.

We come then to a consideration of the questions, How is the good accomplished? and, second, Cannot some modification of the present plan be adopted capable of attaining the same ends without the suffering of the patient and the immense labor involved, and without some of the very serious drawbacks now found associated with it?

It seems to be universally conceded that in moderately severe cases of typhoid fever the reduction of the temperature is a comparatively unimportant effect of the bath, and in the cases of marked and severe febrile movement it is of great advantage over and above the apyretic influence. In other words, it is confessed that the cold bath in typhoid fever possesses an influence of great importance upon the general system far in excess of its antipyretic effects.

It is true that Liebermeister many years ago expressed a belief that the cold bath did good solely by lowering temperature, but at that time the effects of the bath on leucocytosis, oxidation and the true influence of massage were not known, and his belief that the

nervous symptoms are chiefly the result of the fever is no longer tenable, and is strongly combated by Strümpel and others. To use the words of Simon Baruch, the idea that high temperature is the chief determining cause of fatality in typhoid fever must be abandoned (Baruch, p. 110).[1] Further than this, the cold bath does not materially modify the whole body temperature, for, as Baruch (p. 59) states in italics, "the fact is that the colder the bath the less intense its power of reducing internal temperature." He has often seen the mouth temperature after a bath of 65° F. in typhoid fever reduced to normal, while the rectal temperature was two degrees above normal. This is also stated by Liebermeister.[2]

To any one who has studied the general subject of hydrotherapy it is evident that the cold bath exercises the same effect upon the bloodvessels that constant exercise of function always produces, namely, an increase in normal tone and ability to perform normal work. The bloodvessels are in one respect like rubber tubes, namely, they remain elastic as long as they are frequently exercised and become brittle as soon as they lie idle. The cold bath therefore improves vascular tone, and the result of this is a decreased tendency to stasis of blood and lymph in the tissues. Further than this, the peripheral bloodvessels being first contracted by cold are emptied as the central ones are filled, and then as the reaction takes place the flow is reversed, as it were, and the peripheral vessels are flushed by an excess of blood which cools the body by bringing hot blood to the surface and brings to the emunctory portions of the skin effete material for elimination. Finally, when the first shock and rebound of a bath are past the circulation settles back to a normal equilibrium, with the result that anæmic areas have been supplied with blood, congested areas relieved, toxic matter removed from contact with vital cells and carried to the eliminative organs; with the improved circulatory state these are active in their eliminative function. Further than this, by this means perfect oxidation of tissue takes place and probably oxidation of the toxins of the disease ensue. Liebermeister, Röhrig, and Zuntz have shown that the use of cold externally increases oxidation in the body so that a large amount of oxygen is taken up and more CO_2 is eliminated.

So far then we have a lowered temperature, and improved circulation, an elimination of toxic matters, and an improved nervous tone by removal of the fever and the poison. There is still another function performed by the cold bath, namely, an increased leucocytosis, as shown by the studies of Winternitz. This investigator has

[1] Baruch also says that whoever expects to throttle the fever by the bath will be disappointed.

[2] *Handbuch der Path. und Therapie des Fiebers*, p. 102.

shown that the bath, and indeed all applications to the entire surface, greatly increase the number of leucocytes and the percentage of hæmoglobin ; and Thayer of Baltimore has confirmed these observations, finding in typhoid fever in particular that the number of leucocytes is increased from two to nearly fourfold by the means. It would seem probable from Thayer's studies that this increase is an actual one, and not solely due to a dispersing of the leucocytes from certain areas out into the general circulation. So, too, Jacquet of Basel found that the red blood-cells in the general circulation may be raised about 500,000 in febrile cases by the cold bath. Thermes has reached like results.

Again, *no bath in typhoid fever is properly given if active rubbing of the body is not resorted to while the patient is in the bath.* This massage aids the effect of the cold shock most efficiently, possesses all the benefits of ordinary massage, and also greatly increases leucocytosis or leucocytic activity.

There is not space for any details in further support of these assertions ; those familiar with the minute and general effect of massage know them well. J. K. Mitchell has shown that massage increases the number of the red cells and adds to their hæmoglobin value both in health and in anæmia.

Having indicated some of the chief methods by which the cold bath does good, we come to the second proposition, namely, Cannot some equally effective method be carried out, less harassing and exhausting to the patient and devoid of the manifest disadvantages of the bath? I admit that it is not possible for me to present an array of statistics in support of the following suggestions, because it takes a long period of time to collect an array equal to those of the cold bath and a hospital service unusually rich in typhoid cases. I have used cold sponging in a more or less active form for the past ten years in my hospital wards whenever it was needed, and have rarely if ever used the bath. My results in St. Agnes and the Jefferson Hospitals suggest that the following rules be laid down for the treatment of typhoid fever cases :

Control the fever when it reaches 102° F. by sponging. The patient being stripped and laid on a rubber sheet or blanket placed over such a sheet, he is to be sponged with water adapted in its temperature to his needs, and it is to be remembered the rapid application of a low temperature is more refreshing than the prolonged application of a higher temperature (Baruch). The chief advantage of the cold sponging lies in the shock and reaction. This is better obtained by the use of ice-sponging than by the bath. The patient's surface is always bright red in ice-sponging, often blue in the bath, and that the fever is not the chief danger in the case renders the fear that as great a

reduction from the sponging will not be reached as from the bath of little importance except in hyperpyrexia and as a matter of fact it is equally powerful if profusely used.

Shattuck tells us that he has found no marked or constant difference in the antipyretic value of cold sponging at 60° F. for twenty minutes, the cold pack at 60° F. for twenty minutes, or the cold bath at 70° F. for ten to fifteen minutes.

Finally, if ice-rubbing with friction does not bring the temperature down to 100.5° or 101° F. in twenty minutes resort may be had to the tub; but ice water will have to be employed in the tub if ice-sponging has proved insufficient.

It is essential when the sponging is used that more of it be applied to the back than the front of the body, for at the back the great muscles and thick skin retain the heat as a reservoir, which is not cooled if only the front of the body is sponged. In the cold tub it is impossible to apply friction to the back, and, therefore, we cannot promote an active circulation in those parts. Further, the posterior surfaces are the ones apt to be congested and sore from the dorsal decubitus, and, therefore, need the stimulant effect of the bath, as do the kidneys and other deeply situated organs. That this treatment is of value is shown by the marked redness of the skin, the improvement of the circulation and respiration, and the cleared mind.

As an illustration of the manner in which the use of cold other than by plunging is abused, I may cite an instance named by a recent writer. A male of eighteen received baths during the second week of an attack of typhoid fever, and was so seriously depressed by them that a so-called "cold pack" was used. This "cold pack" consisted, we are told, in wrapping a patient in a cold wet sheet and then wrapping him in a blanket for an hour. If there be any fever present, such a pack in a very few moments becomes not a means of materially reducing fever, but a hot Russian bath, and I know of a case in this city in which a hyperpyretic patient was so treated and speedily died. This case just quoted is cited by the author as one which shows the comparative effects of cold bathing and cold packs, although the former were used in the second week and the latter in the third, and although the cold pack as described is not an antipyretic measure of any moment. This is not a comparison between cold bathing and cold sponging, yet one reading his text would get the impression that all other methods of reducing temperature than plunging in typhoid fever were inefficient.

It is advisable not only to use friction in a light form, but to use moderately active massage with the same objects in view as when the rest-cure is undertaken, for the proper treatment of typhoid fever is a modified rest-cure. I am firmly convinced that by this means bed-

sores, local congestions and effusions, œdematous swellings, peripheral nerve pains, and muscular feebleness will be largely decreased; and Pospischl has shown that mechanical irritation of the skin is capable of increasing heat loss 95 per cent.

Whatever may be said in favor of the plunge bath in typhoid fever in adults, nearly every careful clinician recognizes that it does not act well as a rule in children. In the first place, they fail to react in many cases; in the second place, they not only object to it, as do their elders very often, but their objections, instead of being protests in words, are protests in screams of fright; and I have more than once seen, in the practice of other physicians, children screaming and fighting when the nurses attempted to give the bath, and exhausting themselves to such a degree that any possible advantage gained by the bath was greatly overbalanced by the excitement. Because of the small body of a child it is possible in every case to reduce the temperature by cold sponging with friction.

I feel that I have failed to make myself understood if any reader of this article considers that I am opposed to the use of cold bathing in fevers. No one could be a more firm believer than I in its value. I believe that all typhoid fever cases with sufficient fever to require relief should be treated by cold, but I also believe that the treatment should be suited to the needs of the case—that one patient should be sponged with cold water, another rubbed with ice with friction as well, and another plunged. So far I have yet to see a case in which ice-rubbing did not reduce the fever if it was properly used with active friction. Very often I have been informed that the fever could not be reduced in this way, but on overseeing the methods used found them faulty, and that the friction was supplanted by gentle stroking instead of active rubbing. The rubbing must be hard enough to bring the blood to the surface. I have many charts showing that in nearly every instance cold rubbing is more effective than plunging.

It has been claimed that the use of ice-rubbing is more disagreeable to the patient than the plunge. If it is, I have yet to see the patient who said so. On the contrary, I have again and again given medical students the choice of the plunge or the ice-rub, and have never known them to choose the plunge or object to the rubbing with ice.

Tympanites is usually present to greater or less degree at some period of an attack of typhoid fever. In cases pursuing a moderate course and which have been well treated in the early days of the illness it often scarcely amounts to more than a flatulent distention of the bowel, which is relieved by passing the gas either with or without the aid of carminative drugs or external remedies. In more

severe cases the accumulation of gas ceases to cause much pain, but begins to produce respiratory and cardiac embarrassment by the pressure exerted against the diaphragm. Probably this pressure also interferes somewhat with the action of the abdominal organs, particularly the liver and kidneys, and when the distention is very great, as a rule, the patient is to be considered gravely ill because usually great distention does not occur until there is sufficient nervous and muscular atony to make the intestine tolerant of the pressure. Like most of the complications of this disease, excessive tympanites is more readily prevented than relieved. Patients who come under treatment early, whose diet is properly regulated, and who do not receive animal broths as part of that diet rarely develop the condition to excess. Again, the use of cold sponging and plunging so wakens the nervous system to a recognition of the need of expelling the gas that it rarely has an opportunity to collect in large quantities. While the cold bath rarely causes the expulsion of flatus while it is being used, I have often seen the patient pass large amounts of gas when the bath is over, and the equalizing power of the bath over the circulation certainly does much toward improving the abdominal state.

As soon as tympanites begins to be present we should proceed to interfere with its increase, if for no other reason than that if it once distends the bowel it produces at first tolerance and then paralytic distention. Further, it may cause rupture of an ulcer. Aside from the adjustment of the diet the patient, if constipated, should receive a little cascara sagrada by the mouth, and after it has had time to act should also receive a rectal injection to empty the lower bowel of the fæces brought there by the cascara, for often the small bowel passes its contents into the colon fast enough, but the sigmoid flexure is atonic and allows it to collect. The best injection is one of soap and water. If some more active carminative is needed, a pint of milk of asafetida may be used. If this fails to move the bowels then one to two drachms of oil of turpentine may be thoroughly mixed with the asafetida and injected, or it may be well mixed with the soap and water injection. This injection should be used with great gentleness, and preferably be sent into the bowel by the fountain syringe elevated not more than two feet above the patient. The fluid should be conveyed into the bowel by a soft-rubber catheter rather than a short nozzle hard-rubber tube. Gentleness is necessary, because if force is used the pain is apt to be great; because a little time should be allowed for the fæces to find their way into the bowel and soften the hard fæces, and finally because there is a remote possibility of an ulcer being in the sigmoid which might be ruptured by force. At this time a turpentine stupe applied over the belly is

of value, and salol or aspirin, the new salicylate, may be used as an intestinal antiseptic, or in its place, beta-napthol, guaiacol carbonate, or thymol may be given. All of these are best given in capsules.

In cases with diarrhœa the development of tympanites is a graver sign and less easily relieved. In such cases the milk should be stopped because it is "windy" and nourishment confined to eggs and rice. Intestinal antiseptics are now particularly useful and rectal injections are also to be employed, but rarely produce as good results as in the cases which are constipated. Many of these cases are greatly benefited by the active use of alcoholic stimulants at this time for the support of the system, and they render aid in rallying the body to the need of expelling the gas. In some cases intense tympanitic distention follows a tiny perforation of the bowel with gradual peritoneal involvement through oozing of the fæces into the abdominal cavity. Such cases are practically hopeless from both the medical and the surgical standpoint unless recognized very early, and this is very difficult. If an examination of the blood shows leucocytosis, perforation is probably present or is about to occur. (See Perforation.)

Perforation and Hemorrhage.—Now that modern methods have decreased the mortality of this disease so greatly there are only two accidents which, appearing usually unexpectedly, change the patient from a convalescent to a corpse, and these produce nearly 7 per cent. of all deaths at present, namely, perforation of the bowel and hemorrhage from the bowel.

Perforation of the bowel in typhoid fever bears no relation to the severity of the general symptoms. In many cases the reporting physician states that the attack of enteric fever was mild, so that in 444 cases collected by Fitz, fully 200 were of this class. In 14 of the cases the patients belonged to the class known as "walking typhoid" cases. Thus Bennett reports the case of a man who, because of cardiac dropsy, was admitted to St. Thomas' Hospital. He was purged and allowed to eat heartily. Two weeks later he began to suffer from abdominal pain, and the next day death took place from perforation due to typhoid fever. No typhoid symptoms had been present. Finncane reports a case of a man apparently well till two days before death, when typhoid perforations occurred; and Kleinwachter speaks of a woman who, till forty-eight hours before her death, was at business, and who was suddenly stricken and died from this cause.

When perforation occurs the symptoms are apt to be ushered in by agonizing pain, usually felt in the appendicular region, which may be severe enough to rouse the patient from a considerable degree of coma. The belly-wall speedily becomes tense and

tympanitic, and all the symptoms of a general diffuse peritonitis speedily ensue. The pain may, however, not be persistent, but pass away or become modified, as the peritoneal inflammation resulting from the escape of fæcal matter into its cavity becomes more and more septic. The pulse becomes rapid and running, and collapse may speedily assert itself. When this occurs death speedily comes on, the patient dying in a few hours, or, again, he may rally and survive for several days. Early death is, however, the more common result. Thus in the collection of 34 cases made by Fitz, of Boston, 37.3 per cent. died on the first day, 29.5 per cent. on the second, and 83.4 per cent. in the first week. During the second week 9 died, in the third week 4 died, and 2 other cases lived thirty and thirty-eight days respectively. If collapse does not ensue, the rally of the system results in a rise of the temperature to a point higher than before the accident, and this movement is often accompanied by chills and rigors. Usually by the second or third day the peritoneal symptoms become more and more marked, the condition of the patient more and more asthenic and depressed, and death results by the fourth day from a general peritonitis with toxæmia from the absorption of toxic materials. In other cases the onset of the perforation is insidious, the belly before the perforation may have been moderately tympanitic, but now becomes intensely hard and swollen; the pain, which in some cases is so severe, does not develop, but the great fall in fever followed by a rise, and this again by rigors, it may be, gives evidence of the grave accident which has occurred. The pulse becomes increasingly rapid and running, and the respirations more and more costal and less and less diaphragmatic, until the patient sinks out of life, without much, if any, suffering, in much the same manner as one sees death come to a case of diffuse septic peritonitis due to a pus-tube or an old appendicitis. In such cases the perforation is usually very small, and is so surrounded by adhesions that the escape of the intestinal contents is very gradual and insidious, infecting the peritoneum without the escaping fluid being copious enough to produce great pain or infection. This possibility of perforation of the bowel taking place insidiously has been mentioned by Sydney Phillips, of London. To use his words: "In some cases of typhoid fever where nerve-tone is already lost and the tympanitic belly is soft and doughy, perforation and after-peritonitis may occur almost insidiously with little pain, collapse signs, or alterations in temperature." The former type of case is illustrated by the case of a medical student under my care, who, while convalescing from a very mild attack of the disease, and who had had a normal temperature for several days, was seized at midnight with agonizing pain in the epigastrium so severe that he implored his father

to relieve him or kill him in order to stop his suffering. He rapidly passed into collapse, and died in eight hours.

The insidious form is shown by a man who came under my care in the third week of the disease, much exhausted and emaciated, but without very high fever at any time. At the end of the fourth week he seemed to be doing very well, but his temperature, which had been approaching the normal, suddenly rose to 104° F., accompanying a chill; his belly became enormously distended, his breathing became more and more costal, and he died at the end of the third day from exhaustion and asthenia, with all the physical signs of perforation.

In this connection it is interesting to note that a sudden fall in temperature is not a symptom necessary to the diagnosis of intestinal perforation. On the contrary, there are many cases on record in which a rise of temperature follows this accident. Thus, Lereboullet states that in all the cases of perforation he has met with there has been a rise, not a fall, and he quotes Lorain, Brouardel and Thoinot, Griesinger, Amould, Lemoine, and Homolle as agreeing with him. Monod also reports such a case. Dieulafoy goes so far as to assert very positively that peritonitis from perforation very rarely announces itself acutely with sudden pain and marked constitutional symptoms. On the other hand, its onset is generally insidious. The sensibility of the patient is blunted, the peritoneal infection takes place slowly, and the actual occurrence of perforation may escape unnoticed.

While such cases, due to pin-hole perforations, may occur, they cannot be considered common.

Fitz mentions 56 cases in which the onset of symptoms of perforation were severe, 15 in which it was gradual or latent, and 5 in which there was no sign of perforation. Such cases as the last-named are recorded by Laboulbene, who tells us that there was no sign of perforation save a chilliness of the skin and a slight fall of fever. Barth makes a similar report; and Jenner reports a case which left bed on the ninth day and died some hours later of perforation, there being no complaint of pain made. The diagnosis of perforation is to be reached by the following signs, in addition to those just given: Chief and foremost among these is the demonstration of gas in the peritoneal cavity, so that the liver is pushed away from the abdominal wall in such a manner that the ordinary area of liver-dulness largely disappears. Percussion of the right hypochondrium is, therefore, an essential procedure in the physical diagnosis of these cases. The only fallacy underlying this test is the possibility of a portion of the colon, when greatly distended with gas, slipping up between the liver and the belly-wall, and thus giving resonance; but this is a

rare occurrence. In some cases, however, as already intimated, the symptoms are so insidious, the death so gradual, that a positive diagnosis is not possible, and cases are not rarely seen in which the perforation has not been suspected and is found at the autopsy.

There is one precaution to be taken in cases of suspected perforation which must not be overlooked, namely, that peritonitis may develop from extension of the inflammatory process in the bowel or by reason of the migration of micro-organisms through those parts of the bowel-wall which have been impaired by the ulcerative process. In such cases the pain, swelling, and diaphragmatic paralysis may all be present without being due to perforation; and so closely may the symptoms of perforation be aped that operation has been performed, with the discovery that no perforation had occurred; thus, in a case under the care of Herringham nothing was found at the section and the patient recovered. Perforation may be simulated by rupture of the peritoneum over a swollen mesenteric gland.

Other causes of peritonitis are necrosis of the mesenteric glands, infarction of the spleen, or the development of an abscess in an ovary or Fallopian tube.

Very rarely peritonitis arises from cholangitis, with or without gall-stones; and Liebermeister has recorded two cases in which rupture of the gall-bladder with escape of gall-stones into the abdominal cavity took place.

The period of the disease in which perforation most commonly takes place is at the end of the third week or later. Thus, in twenty-two cases in which reliable information could be obtained by Liebermeister, perforation took place at the end of the second week twice; during the latter half of the third week, six times; in the fourth week, twice; in the fifth week, six times; in the sixth and seventh weeks, twice each; and later than this twice. Nacke found it 84 times out of 183 cases in the first two weeks and 99 later; 62 out of 117 cases in the first four weeks, and 55 later.

More accurate statistics are those of Fitz, who in 193 cases obtained facts shown in the following table:

Date of Occurrence in Perforation.

	Cases.		Cases.
First week	4	Eighth week	3
Second "	32	Ninth "	2
Third "	48	Tenth "	4
Fourth "	42	Eleventh "	3
Fifth "	27	Twelfth "	1
Sixth "	21	Sixteenth "	1
Seventh "	5		

The part of the bowel most frequently perforated in 136 cases was the ileum in 106 cases, the colon in 12 cases, and the vermi-

form appendix in 15 (Liebermeister). Hoffman tells us that out of 20 cases the perforation occurred once near the ileo-cæcal valve, four times at four to six inches above, nine times at eight to twenty inches, twice at four-and-a-half to six feet above, once at ten feet above, and in one case there were no less than twenty-five to thirty perforations in the jejunum. In 167 cases collected by Fitz the perforation occurred in the ileum in 136 instances (81.4 per cent.); in the large intestine in 20 (12.9 per cent.); in the vermiform appendix in 5 cases; in Merkel's diverticulum in 4, and in the jejunum in 2. In 19 cases there were two perforations, in 3 five perforations, and in 4 four. Another case with multiple orifices has been cited. Perforation does not always produce death, however, because it may not cause anything more than a very localized abscess, owing to a protective peritonitis which walls off the general cavity from infection. Elsner reports such cases, and Pearson records a case in which during relapse an ileo-cæcal abscess formed, the pus having a fæcal odor. In another case a man had a perityphlitis on the twenty-eighth day, and passed two ounces of pus by the rectum on the fiftieth day. Keen records a case in which an abscess formed in the right side, which opened into the ascending colon, and finally a fæcal fistula developed. He also records a case sent him by Schureman, of Tom's River, N. J., of an abscess which opened near the anus, giving vent to a great deal of pus, in the third week of the disease. Later another opening formed. Major records a case in which collapse occurred on the eighteenth day of the disease, and three weeks later an abscess burst into the rectum and the patient recovered. Low's case had symptoms of perforation in the third week, and peritonitis. Later an abscess burst through the abdominal wall, but the patient recovered. Again, in Lehman's case perforation occurred at the end of the third week, and death occurred a month later. In the abdominal pus the bacillus of Eberth was found. Schmidt has recorded a case of pyopneumothorax subphrenicus, from which three quarts of pus containing a pure culture of the bacillus of Eberth was obtained.

That death does not always follow rapidly after perforation of the bowel in typhoid fever is also proved by the case reported by O'Carroll, in which perforation of the intestine occurred on the thirty-sixth day, and the patient did not die until the fifty-ninth day, when an adhesive peritonitis was found, and an abscess which had been walled off from the rest of the peritoneum. All of the intestinal ulcers except the one which had perforated had healed. (See also Operative Interference.)

Without doubt many of the cases of so-called perforation which have been reported as ending favorably have been cases in which there was no perforation, and only a more or less severe localized

peritonitis. The symptoms of this condition may be so precisely those of perforation that an autopsy or exploratory incision may be needed to differentiate them, and peritonitis may arise from so many intra-abdominal lesions that its presence from these causes must always be suspected.

The question as to what is to be done when once a diagnosis of perforation is made is not difficult to answer. The latest and most important contribution to this subject is that of my honored colleague, W. W. Keen, whose latest paper contains the following words, which should guide us in our decision of the case. He asks, "In what cases shall we operate?" To this he replies:

"Practically every case of perforation, unless the condition is such that a recovery is evidently hopeless. The better the general condition the better the prospect of cure, and perforation occurs quite as often in mild cases as in severe, and possibly even more frequently. One case was operated on twice, with a fatal result; one case three times, and yet recovered. The operation has been followed, as is possible after any abdominal section, by intestinal obstruction. Cushing's case and Finney's were operated on for such a post-operative obstruction, and both recovered. C. B. Porter's patient died of an unrelieved obstruction; possibly a second operation might have averted death. Finney's remarkable one of seven later complications, yet happily resulting in recovery, encourages us never to despair. No *age* is a barrier, yet, as the subjoined table—derived from the entire series of 158 cases—shows, age apparently has considerable influence on the recovery-rate:

TABLE OF RECOVERIES AND DEATHS WITH REFERENCE TO AGE.

Age.	Recovered.	Died.	Recovery Per cent.
Under fifteen	7	6	53.84
From fifteen to twenty-five	4	39	9.30
From twenty-six to thirty-five	10	33	23.26
Over thirty-five	6	14	30

This shows that from the fifteenth to the twenty-fifth year is the most unfavorable time to operate; while the most favorable are over thirty-five, and especially under fifteen. Again, sex seems to have considerable influence on the mortality-rate, so far as can be judged from 158 cases. In my table the sex is mentioned in 125 cases, of which 106 were males and 19 females—84.8 per cent. of males. This preponderance of males would be even greater were military and naval surgeons alive to the possibilities of saving life in this perilous condition. I have been informed of a considerable number of such cases dying without operation during our late war with Spain. Of the males, 85 died and 21 recovered, a recovery-rate of 18.1; 11 females died and 8 recovered, a recovery-rate of 42.1 per cent. In

other words, while the number of operations in males has been over five times as many as in females, the recovery-rate of females has been over twice that of males. Again, I have analyzed the recovery-rate in the various *weeks of the disease.* The third week gives, as is well known, the largest number of cases of perforations, the second following close upon it. As is seen by the subjoined table, the mortality-rate of these two weeks is by far the worst; yet even these two weeks yield a recovery-rate of 16 per cent., more than three times that of unoperated cases, and in the fourth week this recovery-rate is doubled:

TABLE OF RECOVERIES AND DEATHS WITH REFERENCE TO THE WEEK OF THE FEVER.

	Recovered.	Died.	Recovery Per cent.
First week	2	1	
Second "	5	22	18.57
Third "	8	42	16
Fourth "	4	8	33.3
Fifth "	1	5	
Sixth "	14	2	
Seventh "	2	3	
Eighth "		1	
Ninth "		1	
Eleventh "	1		

To the question, "When shall we operate?" Keen replies:

"The earlier the moment at which the operation can be done after the immediate shock of the perforation—provided, of course, there has been any, as is sometimes not the case—the better it will be for the patient.

"The recovery-rate in the first four hours is 25 per cent.; from four to eight hours, 8.33 per cent.; and for all cases operated on within the first eight hours the average is 15 per cent. In the third four hours, from eight to twelve, the recovery-rate is 25 per cent., which is still below the recovery-rate of operations done from eight to twenty-four hours, which is 29.09 per cent.; or in the second twelve hours, which is 30.76 per cent.; after twenty-four hours the recovery-rate falls to 13.63 per cent."

An invaluable and never-to-be-neglected aid to the diagnosis of perforation is the examination of the blood. If an increase in leucocytosis is found in conjunction with other symptoms, perforation is probably present; and, indeed, it would appear that as ulceration approaches the peritoneal coat of the intestine, so that it is about to rupture, some increase in the number of the white cells may be present, so that a warning may be found, if it is sought for.

If surgical aid is not at hand, the patient's system should be stimulated to overcome shock, and enough morphine given to prevent severe pain, which in some cases is atrocious.

Hemorrhage may arise from ulcerated Peyer's patches, from ulcerated glands in the colon, and from dilated hemorrhoidal veins. The latter should be investigated before the diagnosis of hemorrhages due to typhoidal ulceration is made.

An important point in this connection is the question as to the real danger to the patient from hemorrhage. In this opinions greatly differ. Thus Fitz tells us that it is always a serious symptom, but rarely fatal in private life; but that it may be very disastrous is shown by the fact that Liebermeister mentions 49 deaths due to this cause out of 127 deaths; Murchison, 53 deaths from hemorrhage out of 100 deaths; and Homolle, 44 per cent. in 498 deaths. Osler asserts that death occurs in from 35 to 50 per cent. of hemorrhagic cases. Out of Griesinger's 32 cases 10 died, 7 of these within four days of the hemorrhage. Liebermeister tells us that among his own cases 38.6 per cent. died when they had hemorrhage, as against 11 per cent. without this accident; and Tyson tells us that the 7 per cent. mortality in his cases under the bath treatment was due entirely to hemorrhage or perforation. It is evident that Osler's percentage is about correct. On the other hand, it has been noted by some clinicians that if the hemorrhages are not sufficient to produce profound exhaustion the patient often does better after this occurrence than before. This fact was at one time insisted upon by Alfred Stillé, and it is certainly true in a certain proportion of cases. While, as a general rule, the danger is in direct ratio to the quantity of blood lost, recovery may occur even after enormous quantities have been passed. I had a case which recovered in which no less than four pints of blood were lost at one bleeding; and Phillipps and Wakefield, in 1882, saw a patient who bled "two chamberfuls" and recovered.

It seems hardly necessary to point out that the ordinary measures which are instituted to combat the symptoms of hemorrhage in surgical cases are also to be instituted in the presence of hemorrhage complicating typhoid fever. The foot of the bed should be raised from a foot to two feet so as to aid in the circulation of the blood in the base of the brain by gravity. Esmarch, or elastic flannel, bandages should be applied to the upper and lower extremities, running from the extremities toward the body; and should the patient seem very much shocked by the occurrence of the hemorrhage I believe it is advisable to administer stimulants in the form of small doses of whiskey or brandy, frequently repeated if they are needed, rather than in large doses, since it is our object to avoid stimulating the circulation so much as to disturb the clot which may be beginning to form in the leaking vessels, and which might be disturbed if the patient should become thoroughly stimulated by the alcoholic bever-

age; in other words, we use small quantities to fend off fatal collapse, but we must avoid causing any distinct increase in arterial pressure. A hypodermic injection of morphine to produce intestinal quiet and permit clotting at the leaking point is of great service, and a pill of Monsel's salt of 1 grain may be given every hour with the hope that it will help coagulate the bleeding at the ulcer. The pill should be hard, so that it will escape into the bowel from the stomach before it is dissolved. Another method which may be tried, although as yet it has been used to such a very limited extent that we have no way of determining its real value, is hypodermic injections of gelatin in normal salt solution, as suggested by some French practitioners, who claim that its use increases the coagulability of the blood. Eighteen grains of pure gelatin and eighteen grains of common salt are placed in two ounces of sterilized water and injected hypodermically by means of the ordinary antitoxin syringe into the loose tissue of the anterior abdominal wall or of the flank. In some instances these injections are quite painful, perhaps because they come in contact with the superficial nerves; in other instances they give the patient very little discomfort, and in any desperate case I should certainly try them.

Now that surgery has advanced so far that it is advisable for us to interfere in almost every case of intestinal perforation, hemorrhage from the bowel in typhoid fever remains our chief dread. There is no denying the fact that it is a most alarming and even fatal complication. Neither is it of any advantage for us to shut our eyes to the fact that all the therapeutic remedies that I have named must fail in certain cases. We can only hope that surgical and medical diagnosis may advance to such a point that it will be possible in the presence of hemorrhage of this character to open the abdomen, find the bleeding point, and arrest the bleeding by those surgical measures which must be employed to check it in other portions of the body. Even if this were possible, a certain proportion of cases would die, because the shock of the operation combined with the loss of blood in the presence of an exhausting disease would be more than they could withstand.

There are a number of other complications of typhoid fever, of comparatively little importance, which must be discussed before leaving this important subject. One of these is hiccough. In certain cases manifesting great asthenia and depression this symptom becomes a constant, annoying, and dangerous complication. It nearly always depends upon adynamia, and can sometimes be put aside by stimulants. Where the hiccough is incessant, and it is difficult for the patient to swallow, alcoholic stimulants may be given hypodermically; in other cases, Hoffman's anodyne by the mouth frequently relieves,

or in still others tincture of musk in doses of 5 to 20 drops by the mouth, or musk itself in doses of 5 to 20 grains by the rectum in sterilized water is efficacious. In other cases counter-irritation applied over the pit of the stomach seems to be of value. In still others, 30-drop doses of spirit of chloroform and 30 drops of spirit of camphor may be administered in water or in a little brandy.

For the headache, which is often unceasing and very annoying, particularly in the early stages of the disease, we know of no better remedy than a combination of bromide of potassium and caffeine, which is put up by different manufacturing firms at the present time for use in ordinary headache. Caffeine seems to clear the mind, acts as a good cardiac stimulant, and increases the elimination of toxic materials by the kidneys. These preparations ought not to be used unless the headache is so severe as to demand relief, nor to be given in such full doses as to produce a very distinct physiological influence; our object should be simply to moderate the severity of the pain. These preparations will also be of use in many of the cases of backache. The backache is also relieved by cold sponging, or rubbing the small of the back with chloroform or some other liniment.

Delirium arises as the result of the high temperature, of toxæmia, or profound asthenia—perhaps most frequently it is due to the latter cause. As a matter of fact, severe and persistent delirium is not likely to occur in cases which are seen early and submitted to the cold bath treatment, either of the full or modified form which I have already discussed. Many of these cases present a marked improvement of the delirium when they receive proper quantities of alcoholic stimulants; but, on the other hand, it must never be forgotten that overdoses of alcohol may produce alcoholic delirium.

In this connection I wish to earnestly protest against the abuse of strychnine in typhoid fever. It is not a true stimulant to the heart in the sense that alcohol is, and simply serves to irritate the nervous cells of the body, frequently causing an irritable temperature and great nervous irritability as well, with a small rapid, running pulse, which speedily disappears when the strychnine is stopped. The profound asthenia in this disease may indicate strychnia to meet a crisis or collapse; but its employment day after day is distinctly against proper ideas of its value, and, while at the present time many practitioners are using it in this manner, I am convinced that it is abused.

Appendicitis not infrequently complicates typhoid fever, perhaps because of irritation occurring in the caput coli, or an extension of the pathological process takes place directly or indirectly into the appendix. Under these circumstances I believe that the physician should very carefully watch the spread of the condition, and if the

pain is severe and evidences of local mischief are marked a surgeon should be called in at once to consider the wisdom of operating, for while an operation, of course, is a serious complication in the course of typhoid fever, the development of severe appendicitis is worse if it runs its course. In a certain number of cases of appendicitis complicating typhoid fever in which the symptoms are merely those of appendicitis in a mild degree the surgeon should be cautioned about urging an operation until it is evident that the local inflammation is gaining such headway as to endanger life if it continues. No hard and fast rule in regard to the surgical treatment of appendicitis complicating typhoid fever can be enunciated. In each instance the physician must decide how severe the inflammation is, and whether it can be treated by a local application of cold or by an operation. Opium should not be used, as it masks the actual state of the inflammation. If the pain is unbearable, doses sufficient to relieve agony but not large enough to stop pain are indicated, for pain is a valuable diagnostic sign.

There still remains to be considered the very important question of the use of stimulants in typhoid fever. There have been those who have recommended that from the beginning to the end of the attack alcohol should be given, and still others who have gone so far as to say that it is a drug which can be entirely dispensed with in the treatment of this disease. As a matter of fact, neither of these statements is correct. A great majority of typhoid fever cases certainly do better if they receive in the second and third weeks of the disease sufficient quantities of alcohol to support the system and to combat asthenia. While it is true that a certain number of cases of typhoid fever do not need alcohol, it is also a fact that a majority will be benefited by it. The dose of the alcohol depends upon the feebleness of the circulation and the general asthenia of the patient, and the physician should determine the quantity needed by observing the degree of adynamia, by studying the pulse at the wrist, and, still more, by listening to the heart. If the heart-sounds are distant and feeble, manifestly alcohol in sufficient doses to produce an improvement in the circulation should be given. Sometimes a tablespoonful of good whiskey or brandy, well diluted with milk or water, and given three times in twenty-four hours—that is, at eight-hour intervals—is quite sufficient; and in other cases very much larger quantities than this should be given. In many cases it is better to give a dessertspoonful every four hours rather than the tablespoonful every eight hours. Beginning with moderate doses, the physician should gradually increase them if the feebleness is not readily put aside; and we have at times seen patients taking as much as eight to sixteen ounces of alcohol in twenty-four hours with advantage. As a rule, these large doses are

required for only a few days at a time when the symptoms of depression are most marked; and it is a therapeutic fact that if the patient does not obtain benefit from twelve to fourteen ounces in twenty-four hours he probably will not be benefited by larger quantities, or, in other words, he will be beyond the aid of alcohol. It is important to remember that whiskey should be of the best quality so as not to irritate the stomach; and if diarrhœa is present brandy is preferable to whiskey. It is also important to remember that in many cases of typhoid fever in which the stomach seems to rebel against the use of alcohol a change from whiskey to brandy, or from brandy to sherry wine, or port, or champagne may be advantageous, in that the stomach will retain these alcoholic beverages when the others are rejected; and it is also important to remember that old wines, or, in other words, wines of "high bouquet," will often agree with the stomach of a typhoid fever patient when younger wines disagree. I have seen lives saved a number of times by the use of old wines when the younger alcoholic stimulants could not be taken at all.

In regard to the use of digitalis, it has never seemed to me that this drug exercised a useful influence in the average case of typhoid fever. In the first place, the continued febrile movement to a large extent prevents the digitalis from exercising its physiological influence, and the myocardium in severe cases of typhoid fever is often so degenerated by the typhoid toxin that the digitalis does not seem to act upon it as it does in ordinary non-febrile affections. Further than this, it is well known that digitalis frequently irritates the stomach, and a similar fact holds true with regard to strophanthus, and in full doses this drug is particularly apt to cause laxity of the bowels. As a matter of fact, the drugs that we have just mentioned are so far below alcoholic stimulants in value in the treatment of typhoid fever that they should scarcely be discussed upon the same page.

Bedsores are comparatively rarely met with in typhoid fever cases at the present time, chiefly because the use of the cold sponging or plunging keeps the skin clean and prevents the patient lying in one position for so long a time that local congestion takes place with secondary necrosis of the dependent portions of the skin. The friction used in cold sponging also seems to impart circulation to the dependent portions of the body, or prevents stasis; and trained nurses are taught in their hospital work that a bedsore ought never to develop in typhoid fever, and if it does develop, it is due to carelessness that is inexcusable. In those cases which come under treatment so late in the disease that bedsores have already formed, or are about to form, several methods may be carried out for their prevention or treatment. If the skin looks inflamed, or is about to

break down, it may be gently rubbed with alcohol and water in equal parts, or with water to which has been added a drachm of alum to the pint, or in other cases the part is to be painted with a solution of nitrate of silver of the strength of 40 to 60 grains to the ounce. In still other cases the part may be anointed with a thick layer of oxide of zinc ointment, over which is placed a single thickness of surgical gauze or lint; or the inflamed spot may be protected from pressure by having the patient lie upon a circular air cushion in such a way that the surrounding parts bear the weight of the body. In still other instances the physician can order the druggist to make soap plaster which shall be spread upon chamois skin so thickly that when it is applied against the part of the body that is inflamed it will act as a general support to the skin and so tend to prevent breaking down. If a bedsore once develops, the ordinary surgical rules of cleanliness and antisepsis should be strictly enforced; the surface should be washed daily with a solution of peroxide of hydrogen, care being taken that all sinuses are laid open sufficiently to allow thorough drainage and irrigation. After the use of the peroxide of hydrogen the part may be cleansed with a warm or hot normal salt solution and dressed with some antiseptic drying-powder. As a rule, it is not wise to apply iodoform or other iodine powder to such sores, as there is danger of absorption. Further than this, iodoform does not seem to act well upon such tissues. In some instances, particularly as convalescence begins, healing of the ulcerated surface may be aided by the application of glutol.

It is not to be forgotten that sometimes toward the close of an attack of typhoid fever the temperature and pulse rate remain above normal or fail to become constantly normal as we desire. If upon making a careful examination of the patient we find no adequate cause for this in the sense of an organic lesion to produce these states, it should be borne in mind that they may be due to exhaustion and starvation. This condition has been called by DaCosta "bed fever," and by others starvation fever. Allowing the patient to get out of bed a little more each day and giving a good, nutritious, stimulating diet will often cause a disappearance of these symptoms. I have seen a similar state produced by the continuous use of strychnine in full doses at this time. Stopping the use of this drug has resulted in a fall to normal in temperature and pulse rate.

MALARIAL FEVERS.

By JAMES M. ANDERS, M. D., LL.D.

Prophylaxis.

This embraces two considerations: (*a*) The destruction of the malarial parasites outside of the body, or the modification of the soil, so as to prevent further propagation of the latter; (*b*) Individual prophylaxis.

1. **The Destruction of the Malarial Parasites Outside of the Body, or the Modification of the Soil, so as to Prevent the Continued Propagation of the Latter.**—Attempts at the direct destruction of the parasites in the outer world must needs, in the present state of medical science, prove only partially successful; but our knowledge of the conditions essential to the development of the malarial poison in the soil should, it seems to me, lead to the successful conversion of malarial into non-malarial soils. These conditions, so far as definitely known, are—

(*a*) *A Certain Degree of Humidity of the Soil.*—It is particularly the swamps that are overflowed at certain seasons and then exposed to the direct influence of the atmosphere, or, more specifically stated, to the *action of oxygen of the air* at certain other seasons, that are breeding-places for malaria. Marshy districts, affording luxuriant vegetation, are equally notorious as malarial foci.

(*b*) *The temperature of the air* is, *per se*, a factor indispensable to the development and multiplication of the malarial germ, since the plasmodium becomes inactive at a temperature below 65° F. On the other hand, plasmodial growths may be arrested by an exalted temperature. Such facts as these explain why malaria is often confined to the lowlands and to estuaries and the deltas of rivers. They enable us to see clearly why certain districts which were formerly liable to the affection should have become, as the result of denudation of the virgin soil and its subsequent drainage and cultivation for considerable periods of time, entirely free from the disease; and, on the other hand, why the upturning of the virgin soil or removing the surface of the latter may be followed by the appearance of malaria in localities in which it has been previously unknown. Whilst the soil may be presupposed to be the natural "home and cradle" of the

malarial poison, we are not acquainted, as yet, with all of the telluric conditions upon which its presence or absence depends. In this connection the fact should be emphasized that not all marshy districts are malarial; and again, that the disease has been met with in dry, sandy soils, and even on distinctly rocky strata.

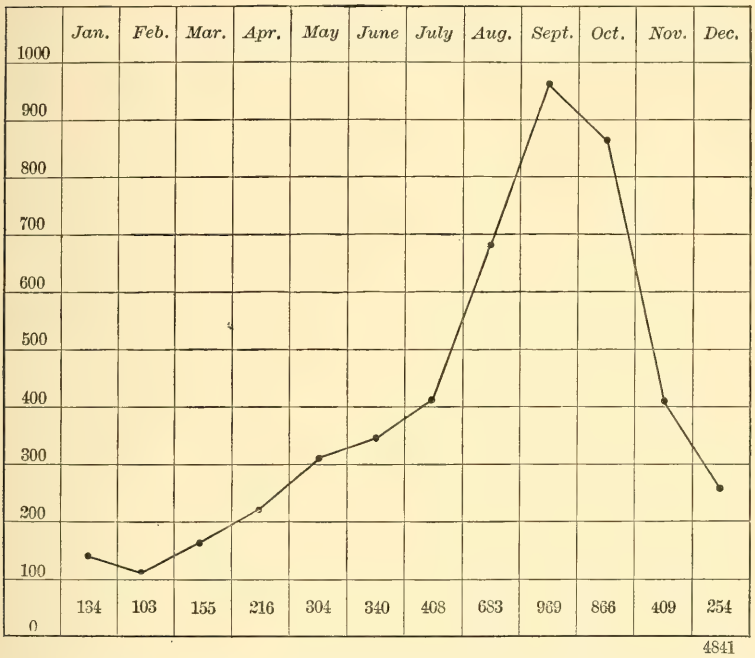
If the concurrence of the above-mentioned conditions is conducive to the growth and multiplication of the malarial hematozoa, then the question arises whether any natural or artificial modes of rendering malarious localities salubrious can be indicated. "Among the various devices which we owe to the ingenuity of man there is, perhaps, none to which attaches more importance than that of drainage."[1] The value of subsoil drainage, with the view of ridding highly malarial regions of their redundant moisture, can be proved by a consensus of eminent opinion, and in consequence of a full appreciation of this fact numerous hydraulic systems have been devised with varying though, on the whole, excellent results. To achieve the same happy object it has been recommended to plant trees, the number to be proportioned to the needs and extent of any special locality, on account of the extreme activity of the transpiratory function exhibited by growing vegetation and the consequent absorption of excessive moisture from the soil. "This application of a scientific principle is best adapted to soils having no natural subsoil drainage, as, for example, in marshy districts, under which conditions rapidly growing trees (eucalyptus globulus, etc.) have a decided effect."[2] There is much evidence of a practical kind to bear out this view. Swamps and morasses are frequent in Ireland, owing to the want of trees to drink up the superfluous moisture (D. Horwitz). In Algeria, according to the observations of Gimlet, extremely malarious districts have been rendered quite harmless in four or six years by the absorbent action of, and evaporation from, the leaves of the eucalyptus globulus. On the other hand, these favorable results have been obtained neither by the French, who have attempted large plantations of the Australian eucalyptus globulus in Africa, nor by the Trappist monks, who made similar trials in Italy. Perhaps the chief reason why seeming advantages were not realized in Africa and Italy lies in the fact that the eucalyptus is cultivated with great difficulty. There are many conditions of climate and soil in which its successful cultivation is impossible. It may be assumed, however, that convincing practical proof of the efficacy of trees in rendering swampy soil more wholesome is not altogether wanting, and, if not constantly, at least often, when plantations are properly and successfully made. It will be seen that the favorable influence of trees bears upon only one of the con-

[1] *House-plants as Sanitary Agents*, p. 65, by the author. *Loc. cit.*, p. 263.

ditions favorable to the development of malaria—the reduction of the per cent. of ground-water.

It is a remarkable fact that during a dry period following in the wake of a heavy freshet malarial outbreaks are both frequent and severe. This explains in part the constant and pronounced effect of the season upon the prevalence of malaria. Thus, in temperate lati-

FIG. 3.



tudes most cases occur in the autumn, the maximum number corresponding to the month of September.

This is shown in the accompanying chart (Fig. 3) by the tracing which is based upon 4841 cases of malaria gathered from the records of the leading hospitals of Philadelphia. In the tropics the case seems to be different, as two maximal periods, spring and autumn, and two minimal, summer and winter, obtain. Autumn has, however, the greatest number of cases. If, as I have attempted to show elsewhere, forests preserve a uniform degree of moisture in their soil, there can be no gainsaying their effectiveness in securing more or less freedom from malarial infection under certain conditions. On the other hand and to an equal degree, the dense forests of the tropical regions, with their luxuriant undergrowth of humble vegetation and their thick covering of vegetable mould in a partial state of decay, render the soil more moist and tend to augment the danger of malaria. The bibulous humus overlying the soil forms an excellent receptacle for the

malarial germ in districts naturally malarious, thus placing the plasmodium in conditions most favorable to the influence of the warm climate and the free oxygen of the atmosphere. This observation, although true in the case of the extensive tropical forests, is wholly inapplicable to districts influenced by the presence of plantations under proper care and regulations.

The Mechanical Effects of Trees and Forests in Protecting against Malaria.—It has been remarked by numerous observers that trees in belts or clumps, or even heavy shrubbery, placed between malarial localities and human habitations effectually protect from malarial affections. The wonderful unanimity of the observations recorded by physicians living in paludal districts proves this fact beyond peradventure. A familiar illustration of the influence of the forests in question may be cited here: "A few rows of sunflowers planted between the Washington Observatory and the marshy banks of the Potomac in the opinion of Lieut. Maury have defended the inmates of that establishment from the paroxysmal fevers to which they were formerly liable."[1] In Italy, Maury's experiments have been repeated. "Large plantations of sunflowers have been made upon the alluvial deposits of Oglio, above its entrance into the lake of Isco, near Pisogne, and, it is said, with results favorable to the health of the neighborhood."[2] Another oft-quoted illustration to show the efficiency of trees as intercepters is the clearing away of the forest growth between the Pontine marshes and the city of Rome more than a century ago, at the request of Pope Benedict, and against the recalcitrations of Lancisci, whereupon a decided outbreak of malaria occurred in Rome, some portions of which became uninhabitable.

The question, "How is the effect in question produced?" is pertinent. The late Dr. Flint and Dr. Metcalfe believed that the malarial germ has a peculiar affinity for vegetable life, as well as for organic matter in general, and there is no doubt that the salutary influence of trees and plantations is effected mechanically. The simple experiments by the late Prof. Tyndall afford a correct interpretation: "He found that the air of enclosed boxes at the expiration of three days no longer contained any of the microscopical particles invariably suspended in ordinary air, these all having attached themselves to the sides of the boxes. Into similar boxes he introduced different infusions of meat and vegetable, which for weeks and months remained unchanged, while, as was to be expected, when the same infusions were exposed to the general atmosphere they speedily underwent decomposition, becoming alive with bacteria."[3] If these observations

[1] *Loc. cit.*, p. 272. [2] *Man and Nature*, by G. P. March, pp. 154, 155.

[3] "Floating Matter in the Air," by John Tyndall, F. R. S., 1882, quoted by J. F. A. Adams, *Sanitary Forest-culture*, 1884.

show that minute air-borne matter has a general affinity for organic surfaces, it can be seen how vegetable growth, by intercepting the atmosphere currents laden with malarial hematozoa, would attract to itself the mites carrying the malarial parasites—a practical and mechanical operation. But if, as is commonly noticed, trees and shrubbery serve as feeding- and harboring-places for mosquitoes, their added value as peculiarly natural intercepters of these sometimes plasmodia-bearing insects is not less obvious.

Finally, it is believed with good reason that if the breeding-places of both mosquitoes and malaria, namely, marshy regions and stagnant pools and ponds, especially in the vicinity of populous districts, could be annihilated by effective drainage, malarial diseases would be simultaneously and absolutely prevented. Meanwhile, the recent advocacy of the pouring of kerosene or crude-petroleum oil upon the surface of these malarial waters in the summer-time, before the hatching out of the embryo mosquitoes, is deserving of diligent practice in malaria-infected communities. Drainage should be most carefully planned to avoid any contamination of the drinking-water supply.

2. **Individual Prophylaxis.**—To protect successfully from the hematozoa is in many cases impossible, and yet, by strict observance of certain rules, the number of instances of malarial fever can be greatly lessened. Of these the avoidance of exposure to the air at night is perhaps the most important. It is well known that the malarial poison is more virulent during the night than the day, and children as well as adults should be protected from its influence. They should not be allowed to go out of doors nor to enter malarial localities after nightfall. Exposure in general predisposes to infection by hæmatozoa, as is clearly shown by the far greater relative frequency of the disease among males than females. I have collected 5044 cases of malaria, which give the numerical proportion of 6 to 1 in favor of the males. On the contrary, it may be plausibly held that when men and women are equally exposed sex is without predisposing influence. Although the relation between the atmospheric humidity and the malarial organism is not definitely known, heavy fogs have been known to be particularly pernicious. Hence sleeping in second or third stories of dwellings is far safer than sleeping on the ground floor in malarial districts. This is accounted for by the fact that while the poison escapes from the soil into the atmospheric strata, it never extends far above the earth's surface, owing to the action of the law of gravitation. Farmers and laborers who must work in malarial localities should pass the nights in dwellings situated upon an elevation, however slight. Virgin soil in malarial localities should not be disturbed by newcomers unless in the most vigorous health and

fortified with preventive doses of quinine (see below). Drinking-water not obtainable from the deepest and indubitably purest sources should be boiled invariably before using or washing green vegetables and raw fruit therewith. This precaution applies particularly to explorers, soldiers, civil engineers, workmen employed in railway and canal construction. Persons who are compelled to reside in a malarial district should be careful to select the most favorable site for residence. A high elevation even may protect successfully against paludism. If in a city, the highest points are least apt to suffer, and densely-built portions enjoy greater safety than those more sparsely settled or than solitary rural homes, for the reasons mentioned in connection with the mechanical influence of trees and plantations. Residence on river-banks (which are liable to overflow) should be avoided. The popular notion that entrance into a mountainous region will cause dormant malaria to develop has been corroborated by physicians, and is an indication, according to H. C. Wood, that deposits are formed in the body. The precautionary measures above pointed out should be rigorously followed by those who have had previous attacks, in order to prevent relapses, which are exceeding prone to occur. The latter arise most frequently in the anæmic, poorly-nourished patients residing in paludal districts. Unquestionably, a generous dietary, along with improved hygienic details of living, is among the agencies most powerful to prevent malarial fevers.

Individual prophylaxis also embraces the use of quinine. Doubtless this remedy is no less potent in preventing malaria than in curing it. Among those who are obliged to live temporarily in malarial districts the use of quinine or cinchonine should be an invariable custom. That it is capable of preventing the development of chills and fever has been abundantly proven by practical observations made in the English navy, as well as by American army surgeons during the War of the Rebellion and the late Spanish-American War. The daily dose need not exceed gr. iv (0.2592) of quinine sulphate. Indeed, from personal observations I am convinced that gr. ij to iij (0.1296–0.1944), taken daily, will in most persons bestow immunity from malaria. Laveran recommends a daily prophylactic dose of 0.20 to 0.30 gram of quinine; or 0.40 to 0.60 gram every other day.

In Italy arsenic has been, and still is, much vaunted as a preventive measure. The results of practical experiments with arsenic, however, are somewhat discordant, and it may be safely concluded that it is inferior to quinine as a prophylactic against malaria. The Italians have also been praising the virtues of the fluid extract of lemon quite extensively in the prophylaxis of malaria.

Treatment of Intermittent Fever.

Spontaneous Cure.—At the outset the fact is to be emphasized that the human body possesses natural means of destroying the malarial parasite, and chief among these are the leucocytes. The latter not only accomplish the destruction of some of the parasites during the febrile paroxysms, but also ingest the disintegrated forms after the conclusion of the febrile attacks. Such facts as these go to show that perfect bodily nutrition aids the defensive processes of nature, while a lowered vitality actually hinders spontaneous cure.

Medicinal Treatment.—For the treatment of malarial fevers there is a true specific in *cinchona and its derivatives.* Whilst there are three official varieties of cinchona-bark—gray, yellow, and red—it sometimes happens that they are all derived from one and the same tree. The alkaloids derived from cinchona-bark are various (quinine, cinchonine, quinidine, etc.), but of these, without question, the salts of quinine are the most certain in their action. As a consequence, quinine is to be given preference in all varieties of malarial fever—intermittent, remittent, continued, and irregular—and, although the substitution of one or more of the remaining alkaloids of cinchona may sometimes prove advantageous, this is only in exceptional cases.

The question "How does quinine cure cases of malarial infection?" needs to be answered. It is to be remembered at the outset that the specific organism causing malaria belongs to a sub-class of protozoa known as hematozoa, and that these run their cycle of development mainly within the red corpuscles. The quinine acts directly upon the intracorpuscular hematozoa. This can be observed outside of the body by mixing a drop of a solution of quinine sulphate with a drop of malarial blood. When this has been done it is possible to observe that the hematozoa rapidly assume degenerative forms (Laveran). On account of the fact that pernicious, intermittent, remittent, or continued forms of malarial fever—or, in other words, estivo-autumnal forms—yield less rapidly to the influence of quinine than the simple intermittents, the different varieties would appear to have different degrees of resistance to the action of this drug.

When shall the use of the specific be commenced? There are many reasons, a few of which may be adduced here, why it is desirable to check the course of the disease as early as possible. In the first place, transmission of the simple intermittent into pernicious paroxysms may occur if the disease be allowed to remain untreated for a time. Again, malarial fevers, and particularly the autumnal forms, lead quickly to marked secondary anemia, and especially so if the patient does not enjoy certain leading hygienic requirements—an abundance of food of good quality, fresh air,

sunshine, etc. The blood-changes bring many other disturbances of function in their wake, and rarely initiate that grave blood-disorder, pernicious anæmia. At the present day the tendency is quite prevalent to delay specific treatment for the purpose of making search for the plasmodium, since there is no advantage in commencing the use of quinine during the first paroxysm. During this time the blood may be examined, and this is often needful to complete the diagnosis. Finding the case to be one of malaria, it is my custom to exhibit quinine at the close of the first paroxysm, so as to prevent a recurrence; and, because the malarial organisms are most feeble just after a paroxysm, the administration of quinine then is most effective in preventing a second chill. If the diagnosis of intermittent malaria can be made with reasonable certainty at the physician's first visit, and he has not the opportunity to make a blood-examination at this time, the specific should be commenced at the close of the paroxysm if the patient reside in an infected district. The confirmation afforded to the diagnosis by the anti-malarial influence of quinine is almost equivalent to finding the plasmodium in the blood, and obviates the ill consequences of unnecessary delay. Circumstances might, however, arise which would warrant a careful study of the blood. Fortunately, these cases occur in districts in which malaria is infrequent, and hence less likely to develop into the severer forms.

During the paroxysm of ordinary malarial intermittents the patient should be kept in bed. The first or cold stage demands plenty of covering and the application of heat externally for their placeboic effect. In the hot stage, cooling drinks, the ice-cap with cold sponging, and light covering are suitable measures. The skin should be carefully dried at the end of the sweating stage. It is only in rare instances that more than one paroxysm is witnessed if the treatment instituted be a proper one.

During the apyrexial interval the patient may be allowed to go about, provided that he is prudent and not too much debilitated. This is the period when the specific remedy is to be exhibited. I have found that a daily quantity of 16 gr. (1.0368) suffices to break the paroxysms in the cases met with in Philadelphia. In protracted cases, in severer forms, and in truly malarial regions the daily amount is to be increased to 20 grains or more (1.2960). Some administer the entire daily quantity at one dose from four to six hours before the succeeding paroxysm is expected, while others give it in divided portions. My own practice has been, in recent years, to administer the remedy in divided doses, and I have obtained more favorable results than with the single large dose which I formerly employed. Immediately following the "sweat" I administer 4 gr. (0.2592),

repeating the same dose a few hours later, and the remaining 8 gr. (0.5184), or one-half the daily quantity, six hours before the next paroxysm, the object being to surcharge the blood with the parasitic antidote at the time when the hematozoa sporulate. Theoretically, then, the administration of one large dose, administered from four to six hours before the succeeding chill is due, would charge the blood to a greater degree at the required moment than if the same amount were given in three doses, as above recommended. But quinine is slowly absorbed, and still more slowly eliminated from the system. Formerly, when I prescribed single, large, daily doses, I observed not unfrequently unpleasant though slight toxic symptoms—tinnitus aurium, deafness, etc., and nausea even. These rarely arise under my present mode of administering the quinine. The treatment with quinine should not, however, be long continued after the paroxysms have been broken up, and the drug is best given in capsules, followed by a few drops of hydrochloric acid to aid in dissolving it in the stomach. Pills of quinine may be more convenient, and, if made with aromatic sulphuric acid, are equally efficacious, but not unless freshly prepared. The specific may be also administered in solution, and in this form is more speedily absorbed. The latter, however, is often objected to on account of its unpalatability. When the sulphate of quinine, which is ordinarily employed, fails to give its usual happy results, the hydrochlorate or hydrobromate should be tried; and the latter salts possess two important advantages over the sulphate, in that they contain a larger percentage of quinine and are more soluble. After the paroxysms cease to recur quinine should be continued in doses of gr. vj–viij (0.3888–0.5184) daily for a few days. On the morning of the eighth day gr. x (0.6480) are to be given, and, if no chill occurs on that day, this dose is to be repeated on the fifteenth, and again on the twenty-second day. If the above dose fails, a larger one is to be administered on the latter two days. Phenocoll hydrochloride given in 1.5- to 2.0-gram doses daily has some advocates in the treatment of malarial intermittents and may be resorted to when quinine is inadmissible because of some idiosyncrasy, perhaps. Cardamatis, of Athens, reports good results with methyl-blue in 275 cases of intermittent malaria, some of them being chronic recurrent cases. He gives the drug in 10- or 12-grain daily doses (four tablets) for ten or fifteen days; then suspends it for two or three days, giving a purge at that time. He resumes the administration for three or four days again, and stops for from three to eight days, and so on for about seventeen days out of twenty-two in the quotidian type of intermittent.

Special Modes of Administering Quinine.—(1) *By Enema.*—If quinine cannot be taken *per os*, enemata containing the remedy

may be employed. Each enema consists of gr. xxxvj (1.5552–1.6848) of quinine (adding sufficient tartaric acid to dissolve the latter) in 4 oz. of warm water. Rectal irritability is apt to be produced, however, and absorption is slow and often uncertain; hence this method of administering the specific is not to be advised, except in cases in which the stomach will not retain the drug, and in which, for some reason or other, it cannot be given hypodermically. The quinine enema must be preceded by a copious simple enema, in order to cleanse thoroughly the mucosa of the bowel. If the medicated enemata be ejected, a few drops of laudanum—*e. g.* ♏v–x (0.333–0.666)—may be added.

By Suppository.—It has long been and still is my custom to administer quinine in the form of suppositories to children who are unable to ingest capsules or pills. This is a more ready method than by enema, and in selected cases may be employed also in adults. In my experience it has not proved any more apt to excite rectal irritation than the quinine enemata. The hydrobromate or hydrochlorate should be chosen instead of the more insoluble sulphate. The dose should be one-third larger than when administered by the mouth, and of course its size must vary with the patient's age. For a child of five years I prescribe a suppository containing 6 gr. (0.3888). At least six hours must be allowed for absorption.

By Hypodermic Injection.—The anti-malarial effects of quinine can be quickly obtained by hypodermic use, and the drug is to be thus administered if there be no time for absorption from the stomach (four hours being the shortest period it is safe to allow), and invariably in pernicious types (*vide infra*). For this purpose the more soluble salts (hydrobromate, neutral hydrochlorate, muriate of quinine and urea, etc.) of quinine are to be preferred to the ordinary and less soluble sulphate, which requires the aid of an acid to dissolve it. My own preference has been for the following solution:

℞. Quininæ hydrobromat., gr. xii–xv (0.7776–0.9720).
Glycerini pur., ♏ xv (0.999).
Sodii chlor., gr. j (0.0648).
Aq. destillatæ, q. s. ad ʒj (4.0).—M.
Sig. At one dose, to be repeated in pernicious paroxysms.

The subjoined mixture is also much employed:

℞. Quininæ sulphat., ʒss (1.9440).
Glycerini pur., ʒss (1.9440).
Acidi tartarici, gr. xv (0.9720).
Aq. destillat., q. s. ad ʒj (4.0).—M.
Sig. At one dose.

Kobner advocates the following:

℞. Quininæ hydrochlorat., gr. viii–xv (0.5184–0.9720).
Glycerini pur.,
Aq. destillat., *āā.* ʒss (2.0).—M.
Sig. To be injected lukewarm.

It is to be pointed out that unpleasant sequelæ, particularly in the form of abscesses, are apt to result from this method. By the observance of rigid antiseptic precautions, however, these can in a great measure be averted. It is of the utmost importance that the solutions used contain neither micro-organisms nor crystals, and that both the syringe and the skin at the point selected for puncture be carefully sterilized immediately preceding the operation. If the injection be made into the deeper subcutaneous tissue or into the muscle-structure itself, the likelihood of abscess-formation is lessened.

By Intravenous Injection.—This is the most rapid method of introducing quinine into the blood, but if we reckon the longer period of time required for the necessary preparations, little if any time is saved in comparison with the hypodermic method. The risk of serious consequences is also considerable.

The salts of quinine will occasionally fail, and then other preparations of cinchona may be tried. Among these cinchonine is the best substitute. Some contend that this drug has anti-periodic power almost equal to quinine. It is less expensive than the latter, although the dose is one-third larger, and I can speak with confidence of its efficacy after considerable experience in its use in cases where quinine has failed.

In protracted cases of intermittent malarial fever the salts of quinine and other preparations of cinchona sometimes lose their specific influence, when in moderate doses they are to be employed in combination with arsenic. This is especially true of quinine. The dose of arsenic, beginning with ♏ iv, t. i. d., of Fowler's solution, must be increased until the eyelids become decidedly puffy or albuminosity of the urine has been produced. I have found that a granule of arsenous acid may be administered in augmenting doses, commencing with gr. $\frac{1}{30}$ (0.0021), t. i. d., and increasing to the amount finally of gr. $\frac{1}{4}$ (0.0162) daily. So soon as the disease is under control the dose of this remedy is to be diminished, but the drug is not to be withdrawn for several days afterward.

Treatment of Pernicious Intermittents.—(*a*) **Prophylaxis.**—In nearly all instances the occurrence of pernicious paroxysms can be obviated by the institution of prompt and vigorous management. It is specially important to pursue such a course in seasons and localities

in which this serious type is known to prevail. Under such circumstances to delay anti-malarial treatment until the second or third paroxysms occur in order to examine the blood is next to criminal.

(*b*) **Treatment of the Pernicious Paroxysm.**—The first attack is to be met promptly by the specific, which is to be administered by the hypodermic method (*vide supra*). In this manner the patient must be fully cinchonized and kept under the influence of the drug for several days, in order to prevent a recurrence, if we would rescue him from imminent danger to life. With the positive, unanimous opinion of English surgeons in India to the effect that no depletory form of treatment is borne in pernicious intermittents I fully agree. On the other hand, supportive measures, particularly vigorous feeding, and the timely use of stimulants when the heart's action becomes feeble, are to be urged.

The *diet* should be liquid, consisting chiefly of milk, animal broths, and egg-white. Liquid peptonoids, predigested milk, etc. may be resorted to as occasion demands. The food is to be given in definite amounts at stated brief intervals. When not sufficient nourishment can be introduced into the system by the usual route on account of the presence of gastric derangement (nausea, vomiting, etc.), which is often marked in these instances, then rectal feeding should be instituted. I have found a combination of the two methods of feeding, rectal and gastric, to work admirably in a couple of instances. I commence to use stimulants when indicated, by administering $\frac{1}{2}$ dram (2.0) aromatic spirit of ammonia every forty to sixty minutes, as required; or $\frac{1}{2}$ oz. (16.0) of whiskey or brandy, every two or three hours, augmenting the amount, if the action of the early doses be favorable, until the indication for their use is fully met. It is sometimes necessary to supplement the alcohol by other cardiac stimulants—viz. strychnine, digitalis, sulphur, and ether. The latter are to be exhibited hypodermically.

There are certain other details to be carried out, though of relatively minor importance, and they differ with the varieties of pernicious fever. Thus, in so-called "congestive chills," in which the symptoms of vomiting and purging as well as those of circulatory collapse suddenly supervene, external warmth is highly useful. Morphine, in combination with atropine, administered hypodermically is also of great service, tending to allay the gastro-intestinal symptoms and to warm the extremities. Here, rectal feeding must be resorted to early.

In the **comatose variety**, in which marked nervous symptoms (such as active delirium, rapidly passing into coma) manifest themselves, the fact should be recollected that these alarming features are not due to cerebral congestion, but to the intensity of the infectious

process. They are most successfully met by prompt and energetic anti-periodic treatment. Stimulants are to be given with a free hand, but only with a view to bridging the patient over the critical period, and never continuously. Hypodermoclysis of sterile normal salt solution may also be resorted to in grave cases.

There is a **hemorrhagic form** of pernicious intermittent, which demands, in addition to the measures above recommended, the use of hemostatics. In many of these instances malarial hematuria is the chief symptom, and its treatment is a therapeutic problem of unsurpassed difficulty, although the question would be much simplified if it were definitely known whether or not the quinine is the cause of the hematuria. Plehn,[1] Richardson, and others believe that quinine may produce this symptom, while Steudel and Küchel maintain that this remedy checks the development, and hence the injurious effects, of the malarial parasites. I have met with several instances of hematuria, in connection with the milder forms of malaria, in which no quinine had been taken, and have treated them with quinine (gr. xvj daily), a measure which successfully relieved the hematuria or hemoglobinuria. When the latter symptom appears in the course of pernicious types of malaria, it is the custom among many clinicians to administer the quinine in heroic doses.

Two questions arise here: (1) May not the large amount of quinine act as an irritant to the renal tissues, exciting hemoglobinuria? (2) May not the full doses paralyze the vasomotor nerves of the kidneys and in consequence congestion and hematuria supervene? It has been shown that under these circumstances a large quantity of quinine can be easily recovered from the urine. Doubtless, smaller doses of the remedy would often give equally satisfactory results without exposing the patient to added dangers. The specific treatment, therefore, need not be abandoned in these cases, but I maintain that large quantities are not always necessary to effect a cure. Surely, the malarial parasite produces greater loss of blood within the circulatory system by its destructive action upon the red corpuscles than that which takes place through the kidneys. "In actual cases, the daily loss of red corpuscles in the vessels has been found equal to the direct abstraction of two and one-half pints of blood."[1] The cases in which quinine has exercised an injurious effect upon the kidneys have sometimes been those in which the remedy has been too long continued. This fact may be taken advantage of in the treatment of malaria hematuria, and the quinine discontinued so soon as the blood has been freed from the hematozoa, as shown by microscopic examination. These are the instances in which the interrupted method of administering quinine is to be recommended. Again, I am con-

[1] *Berliner klinische Wochenschrift*, 1895, Nos. 25–27. [2] *Medical News*, Sept. 7, 1895.

vinced that it is the part of wisdom to assist vicarious elimination from the bowels. This is the most rational explanation of the beneficial effects which have been derived from the use of calomel, saline purgatives, etc. In this connection the results of a collective investigation by H. A. Hare assisted by Wilmer Krusen are worthy of brief mention. They received 107 replies to questions which were sent out (the area covered giving an average death-rate from malaria of 70 per cent. or over), and of the thirty-two remedies used, calomel, in from 5- to 60-grain doses, seemed to be most in favor. Five other remedies used by ten or more physicians were tincture of ferric chloride, arsenic, ergot, turpentine, and sodium hyposulphite. Tincture of ferric chloride is employed either alone or combined with arsenous acid, or with small doses of quinine. Sodium hyposulphite may be given in from 20- to 40-grain (1.2960–2.5920) doses every three hours, after thorough purgation with calomel. Ergot is much employed as a hemostatic. Of turpentine, 10 drops every three hours (in capsule), until the urine clears, may be curative, and turpentine liniment is often simultaneously applied to the lumbar region. Warburg's tincture, either with or without arsenic, has also been highly recommended by some practitioners in those cases of malaria in which the hemorrhagic forms seem to be produced or aggravated by quinine.

Treatment of Remittent Fever.

In this variety, a combination of anti-malarial and eliminant measures is essential. If the physician be called during the first exacerbation, a mild mercurial may advantageously be given at the outset, as follows:

℞. Hydrarg. chlor. mit., gr. ii–iij (0.1296–0.1944);
Sodii bicarbonatis, gr. x–xv (0.6480–0.9720).
Ft. charta No. j.
Sig. To be taken dry, on the tongue.

This is to be followed on the following morning by a saline laxative —Rochelle salts ʒij (7.776) in concentrated solution. The mercurial should not be given combined with quinine, but it may be repeated during the course of the individual case, as occasion requires. The process of elimination may sometimes be continued by the use of milder laxatives, such as bitartrate of potassium, ʒj–ij (3.888–7.776), in a glass of lemonade, or the patient may be allowed to drink freely of Saratoga vichy. During the exacerbation, cold spongings of the body, together with the ice-cap to the head, are serviceable. For the intense gastric oppression, nausea, and vomiting—when not relieved by the above-mentioned mercurial—chipped ice by the mouth, or small doses

of cocaine hydrochlorate, either alone or combined with the oxalate of cerium, may be essayed. A mustard paste may be applied until the skin is slightly reddened, and repeated daily while the gastric features persist. The proper time to begin the use of quinine is during the first remission, and large doses are needed to secure cinchonism, such as gr. xv, to be repeated once or twice daily. The first dose may be given at 4 or 5 A. M., the second at 9 or 10 A. M., and the third, if necessary, during the early afternoon hours. In severe types, a fourth dose of the same size may be required. The object should be to obtain the full physiological effect of the remedy at the beginning of the succeeding exacerbation. If the stomach be non-retentive, or if absorption from this organ be too tardy, the quinine had better be exhibited by the hypodermic method (*vide supra*), or, if more convenient, it may be given by enemata. When the physician is called, after the patient has had one or more febrile paroxysms, the first indication is to establish cinchonism in any period of the exacerbation or remission. Says Bemiss, who has had a long and large experience, "I have seen excessive temperature abated, the dry skin become bathed in healthful perspiration, the tongue grow moist, the delirium cease, and the patient enter at once upon convalescence after a single saturation with quinine." In cases which do not yield to the sovereign remedy, pilocarpine in small doses, gr. $\frac{1}{8}$ to $\frac{1}{16}$ (1.0081 to 0.0108), should be administered hypodermically during the height of the paroxysm. Thus employed, pilocarpine has great therapeutic value: it increases the sweating decidedly, and in consequence renders the remission more marked and more prolonged. In a couple of instances I have observed a remittent fever thus converted into an intermittent one, with light and favorable course. The heart, however, must be carefully guarded when pilocarpine is prescribed, as this drug is an active cardiac depressant.

The remittent cases which have been allowed to drag on for one or two weeks often assume a typhoid character, and such cases are greatly benefited by the use of Warburg's tincture (*vide ante*). It should be prescribed in doses of one-half ounce, three times daily in the average case, but the doses must be varied according to the exigencies of the individual cases. After a lapse of several days quinine may be resumed, and will be found to prove beneficial, or even curative. Valvassori-Peroni[1] has reported rapid improvement and cure, in 23 cases of malarial infection, from the hypodermic use of citro-ammoniac ferrous arseniate. Thirty to forty injections were given with a solution which represented 0.05 gram of ferrous arseniate per cubic centimeter; they were graduated from a third or half to a whole syringeful a day.

[1] *Gaz. degli Osp.*, Dec. 28, 1898.

In certain rebellious cases of Cuban malaria it was found that combinations of quinine, ginger, and paregoric, or of powdered myrrh, quinine, and licorice, have been happily successful.

Complications, including local inflammations, are not always controlled by the quinine, but require special measures, the choice of which may be left to the therapeutic judgment of the physician. The strong tendency to renal congestion and suppression of the urine is to be especially emphasized. The leading indication here is to bring about free diaphoresis, by the use of pilocarpine, etc., and cathartics, by means of saline laxatives. I have found, acting upon the suggestion of Page, that a combined steam and hot-water bath is most efficacious in these instances. The patient is placed in a tub of hot water, and then a blanket is put around his neck, its free ends being allowed to extend over the edges of the tub. This may be repeated, if necessary.

The diet should be simple, consisting of milk, albumin water, meat extracts, or animal broths, and the more digestible farinaceous articles. Cooling drinks are grateful, and their palatability may be increased by the addition of grape-, raspberry- or lemon-juice. Stimulants are rarely needed in remittent fever, but in severe and previously neglected cases indications for their use may be presented early. It is to be recollected that a weak heart calls for stimulants. Of these, aromatic spirit of ammonia, camphor, brandy or whiskey may be employed. The effects are to be noted carefully, and the quantity may be augmented or decreased accordingly. The hypodermic use of strychnine and digitalis may also be indicated.

Treatment of Malarial Cachexia.

As in other forms of malaria, so quinine is to be selected first in the treatment of malarial cachexia. It is not, however, to be administered continuously, but at stated intervals. While in charge of the out-patient service in the Episcopal Hospital, Philadelphia, I employed in chronic malarial cachexia and in protracted instances of malarial fever, with very satisfactory results, the sulphate of chinoidine, in daily doses of 30 to 40 grains. In this class of cases, Warburg's tincture (one-half ounce, three times a day) has also been warmly recommended. The eliminant method of treatment is to be combined, and an occasional, though small dose of calomel, followed by a saline laxative, is useful. During the intervals between the latter the milder aperients mentioned under Remittent Fever may suffice. My own experience warrants the belief that full doses of quinine, given during alternate weeks, is the most successful mode of administering the specific. When this fails, arsenic, which is an especially valuable agent in chronic malaria, is to be added to the treatment. Fowler's solution may be used in augmenting doses, until

the daily quantity reaches 30 or 40 minims—gr. $\frac{1}{4}$ (0.0162). If, however, puffiness of the face or albuminuria should appear, the dose should be gradually diminished to 5 minims, which should be continued for a considerable period of time. In those cases of chronic intermittent malarial affections with not too old or firm enlargements of the spleen, and which are resistant to quinine and arsenic, Jacobi claims very good results from the use of ergot. Another valuable agent is iron, and particularly its vegetable salts, which may be combined with a simple bitter. Few cases are curable unless the patient leaves the malarial district forever.

For the malarial *anemia*, which often attains to a severe grade, arsenic in increasing doses has yielded, in my experience, the best results. In a case under my care at the Medico-Chirurgical Hospital, the blood-count showed on admission 2,400,000 red corpuscles to the c.cm. Under increasing doses of arsenic restitution of the red corpuscles was brought about with surprising rapidity; in a single week, while the patient took 8, 9, and 10 minims respectively of Fowler's solution after each meal, the count revealed an increase of from 2,600,00 to 3,500,000. The hemoglobin, which had been reduced to 45 per cent., was, as is usual, regenerated more gradually. The patient was kept in bed during the first two weeks of his stay in the hospital. He had come from a malarial district in New Jersey. I have never been able to obtain favorable results from efforts at reducing the splenic enlargement. It may be mentioned, however, that iodine, dissolved with potassium iodide in sterilized glycerin (25 cgm. of iodine to 25 grm. of solution), may be tried by injecting hypodermically into the flank or back of the patient at regular intervals. H. C. Wood advises, for internal use, the solid extract of ergot, in full doses—*i. e.* from 30 to 50 grains (1.944–3.240), a day—in capsule.

SMALL-POX.

By WILLIAM M. WELCH, M. D.

Prophylaxis.

Of all measures employed to prevent the spread of small-pox, none is so important and efficacious as Jenner's great discovery. There is perhaps no single scientific fact better established than that vaccination, periodically repeated, is capable of effectually preventing the occurrence of that disease in man. In view of this fact it does at first sight seem strange that variola should continue to prevail in civilized communities; and, while nothing appears easier than to control the spread of this disease, or even to eradicate it altogether, yet there are difficulties in the way of accomplishing this end which seem almost insurmountable. These arise from various causes, but chiefly from individual carelessness or indifference about employing vaccination, from a want of unanimity of opinion with regard to its efficacy, and from the absence of a general law making it compulsory. I know that many conscientious citizens are opposed to enforcing vaccination by law, but as every unvaccinated person is liable to contract small-pox and disseminate the infection among others, he should be regarded in the light of a public enemy, and dealt with accordingly. Surely it is not an unreasonable position to assume that no person through ignorance or prejudice should be allowed to contravene the public welfare.

But in the absence of a statutory law requiring the vaccination of all persons, very much can be done in the way of enforcing the measure by restricting the privileges of the unvaccinated. For instance, satisfactory evidence of successful vaccination should be required of every child before admission into public and private schools and institutions for the care of children; no unvaccinated person should be allowed to serve as a soldier in the national army or navy, or in the State militia; and no unvaccinated immigrant should be allowed to land until vaccination has been performed.

In view, therefore, of the great importance of this prophylactic measure, it becomes the duty of all municipal and State authorities to provide gratuitous vaccination for the poor, and, indeed, for all helpless children of careless or improvident parents, no matter to what

class of society they belong. No expenditure of money should be spared by these authorities in order to protect their citizens against a disease so loathsome and fatal as small-pox. From a purely monetary point of view such expenditure is wise, for a single epidemic of this much-dreaded disease in a community may necessitate a greater outlay to care for the indigent sick alone than would be required to purchase the means of protection for that community for a decade of years.

If vaccination were universally practised, and repeated from time to time as circumstances required, there would be little need for other means of prevention; but as it is impossible to attain so desirable a result, recourse must be had to other prophylactic measures, and some of these constantly form quite an indispensable part of the preventive management of small-pox. When this disease appears in a community the chief aim should be to prevent the dissemination of the infection, and of the various means commonly employed to attain this end isolation of the patient is of chief importance. This can only be accomplished with any degree of certainty by having the case removed to a well-organized hospital; and, as it is manifestly improper to treat such cases in general hospitals, it follows that every city and large town should be provided, either temporarily or permanently, with a special place for the treatment of this disease in the event of its outbreak. Certainly, in every large city a permanent and well-equipped institution of this kind is a necessity. It should be located sufficiently remote from the thickly-settled parts of the city as to endanger no portion of the community, while at the same time it should be easy and ready of access. Indeed, the more accessible it is, and the more fully it is provided with modern improvements and comforts, the more willingly and cheerfully will patients consent to removal thereto. It should never be spoken of as a "*pest-house:*" most persons will consent to go to a well-regulated hospital, but to a "*pest-house*" never.

Of course a special hospital of this kind should be managed under strict quarantine regulations. No person, however well protected, should be allowed to visit a patient in the institution except under extreme circumstances, and then only after every possible precaution shall have been taken to prevent his carrying away the infection. The nurses and attendants should not be allowed to leave the hospital, nor come in contact with other persons, until they have had an antiseptic bath and changed their infected clothing. In providing nurses and other employés for the hospital it need not be required that they shall have had small-pox, but they should invariably be vaccinated or revaccinated before entering on duty.

The hospital should be provided with closed ambulances for the transportation of patients. Private or public vehicles should never be used for this purpose. Indeed, this is regarded as so important a matter

PLATE I.

Extremely mild form of smallpox in an unvaccinated child on the sixth day of eruption. Representing a type of the disease liable to be confounded with chickenpox. (From photograph by Dr. Jay F. Schamberg.)

that in some large cities in this country the use of any kind of public conveyance for carrying persons affected with small-pox is prohibited by law, and its infringement is made punishable by fine. Besides being closed vehicles, so as to guard as far as possible against the spread of infection from the patients, the ambulances should also be comfortable. The pain and prostration from fully-developed small-pox require that persons thus afflicted should, when transported, be handled with the greatest care and caution, so that no additional risk to life shall be incurred in consequence of the transfer. Lest infection be spread by the ambulance itself, it should be disinfected and provided with clean bedding, blankets, etc. every time it is used. In order that the public may know the character of the disease it conveys, it should bear the name of the hospital to which it belongs.

Whenever a case of small-pox occurs in a family, the physician's first duty is to vaccinate promptly all members of the family who have never been vaccinated, and revaccinate all others without regard to the character of their previous vaccination. If this be done and the patient sent to the hospital, the disease may be prevented from spreading. When it is known that a person has been exposed to the infection of small-pox, it is advisable not only to vaccinate that person immediately, but to quarantine him for a period of fourteen days, which sufficiently represents the incubation period of the disease. The latter purpose doubtless could be most effectually carried out in a place specially set apart for the care of such persons; hence every large city should, in the event of an outbreak of small-pox, improvise a quarantine hospital or station for the temporary detention of persons suspected of having received the variolous infection. Every such person refusing to be confined in this place should be visited daily by a medical sanitary officer for a period of two weeks, or until symptoms of small-pox appear, in which event the case should be immediately sent to the hospital for isolation and treatment. These precautionary measures are especially necessary among the poor, whose dwellings are always small and often overcrowded. So also in the larger places of habitation, where there is no suitable apartment for secluding the patient, such as hotels, boarding-houses, public institutions, and all dwellings connected with stores, the same constant vigilance and prompt action in regard to vaccination and isolation are necessary to prevent the spread of the disease.

If the small-pox patient is to be treated at home, every possible effort should be made to seclude him from all persons, excepting only such as are required to act as nurses, and they should be protected by recent vaccination. In selecting an apartment for the patient a room most completely separated from all other parts of the house is preferable; but when this is not practicable—which is usually the case

in the ordinary city residence—the uppermost room of the house should be preferred. It should be well ventilated, and, if possible, have an open fire-place, in which fire should be kept constantly burning. All unnecessary articles of furniture, such as drapery, upholstery, carpets, etc., should be removed. Every precaution in regard to cleanliness and disinfection of clothing, bedding, and everything in use in the room should be exercised, so that the danger of spreading the infection shall be reduced to the minimum. A sheet wrung out in a strong solution of carbolic acid, Labarraque's liquid, or some other disinfectant, and suspended across the doorway, may aid in preventing the infection from being disseminated to other parts of the house. While it is impossible to practise aërial disinfection in an apartment occupied by a patient, yet the common practice of placing chloride of lime or some other disinfectant about the room undoubtedly serves a useful purpose, and should be encouraged. If these agents do nothing more, they certainly aid in correcting the bad odors which arise, and thus render the atmosphere of the room more agreeable to the patient and his attendants.

So long as a dwelling is infected with small-pox the entire household should cease to associate with the public. The attendance of the well members at church and other public assemblages should by all means be interdicted. The children should be required at once to leave school, and should not be readmitted until the family physician or some qualified sanitary officer certifies that the sickness has ended, that the house has been thoroughly cleansed and disinfected, and that the danger of conveying the infection to others has ceased to exist. It seldom happens that it is necessary to close a school on account of an outbreak of small-pox in the neighborhood, or even among the pupils, since protection can be so easily and certainly secured from properly-performed vaccination and its timely repetition. Indeed, well-marked evidence of previous vaccination should constitute a prerequisite of admission of children into all schools, public or private. If this rule were strictly observed, school authorities would have but little to fear from the infection of small-pox.

When small-pox makes its appearance in a house, the well members of the household should, as a rule, not be removed, except to a quarantine station or hospital. For if removed to another locality, and the disease should subsequently appear in any of them, a new centre of infection would be established. Better by far would it be to vaccinate or revaccinate all such persons, and have them remain on the premises under sanitary supervision. To depend upon them to practise self-denial of their personal liberty voluntarily for the welfare of the public would be trusting too much to the weakness of human nature; hence, doubtless, the best results would be obtained by furnishing reli-

able guards to enforce not only isolation, but also compliance with all other necessary precautionary measures. Unfortunately, this procedure, if properly carried out, might prove too expensive to be feasible when small-pox is prevailing in a community to any considerable extent; but it would be entirely practicable to deal with the first cases in this manner. Money could not be expended more advantageously than for providing the means of limiting the outbreak of the disease to the original case or cases.

Another means of restricting the spread of small-pox is to apprise the public of the particular locality where the disease exists, so that no one may unknowingly approach within infecting distance of the place. But how to do this without exciting unnecessary alarm is a problem not easy of solution. The plan adopted in some cities of placarding the infected house with a large and conspicuous poster is believed by many to serve a useful purpose, notwithstanding it frequently meets with much opposition. But whether this plan be adopted or not, the sanitary authorities should keep the premises under constant supervision, instituting daily visits by officers qualified and empowered to advise and direct the observance of all necessary sanitary precautions, and, if there be danger of non-compliance, to enforce such arbitrary and restrictive measures as the circumstances warrant.

Disinfection is a highly important prophylactic measure. The infection of small-pox is not only imparted to the atmosphere surrounding the patient, but to all articles which have been used by him or been near him. It clings to these articles for a variable length of time, and they are therefore not infrequently the media by which the infection is conveyed to others. Disinfection consists in the complete destruction of the infecting agent of the disease. Fresh air and sunlight are, in a certain sense, disinfectants; at least, when infected articles are freely exposed to the atmosphere and rays of the sun for some time the infecting principle becomes less and less active, and finally disappears. Therefore the house, and especially the room, occupied by the patient should be freely though cautiously ventilated. If the weather be cool, an open fire upon the hearth would consume much of the infected atmosphere.

Chemistry, however, furnishes the more speedy and reliable disinfectants, and it is upon such that we mainly depend for the destruction of the disease-germs. Some chemical agent of this nature should be brought directly in contact with all excrementitious matter from the patient, and with everything that has been used by him or been near him during the progress of the disease. All discharges, not excepting those from the mouth and nose, should be received into a vessel containing some such disinfectant as chloride of lime, carbolic acid, or bichloride of mercury. Under no circumstances should the excreta

be allowed to flow into the sewer or be cast away without first having undergone disinfection. In country districts, where disinfectants may not be readily obtained, the discharges should be deeply buried in the ground in a locality where there is no danger of contaminating the water-supply. Every handkerchief, towel, and article of bedding and clothing used by the patient should be steeped for some time before leaving the room in a solution of 2 fluidounces of chloride of zinc or 4 fluidounces of strong carbolic acid to the gallon of water, and afterward boiled by themselves for half an hour or longer in plain water; all small articles, such as bits of linen, sponge, absorbent cotton, and the like, should be burned immediately; all utensils used for eating and drinking should be purified by boiling water; and, in short, nothing should be allowed to leave the room without having first been subjected to some form of disinfection.

The attendants should not be more numerous than the necessities of the case require. They should be carefully instructed in regard to the importance of cleanliness, disinfection, and isolation. Not only should they be instructed to exclude from the sick-room all persons not having authority to enter, but also all domestic animals, such as the dog and cat, as they are exceedingly liable to serve as conveyers of the infection.

The clothing of the attendants should be of such material as can be readily boiled and washed, and it should be frequently changed and subjected to this process. No attendant while engaged with the case should come in contact with other persons. On leaving, either temporarily or permanently, a bath should first be taken, using freely carbolic-acid soap, and the hair should be washed with a weak solution of mercuric chloride. No clothing that has at any time been in the infected atmosphere should be worn or carried away from the premises, unless it has first been disinfected.

Physicians also should exercise care lest they may be the means of communicating the infection. When called upon to attend a case of small-pox the physician should not remain in the infected atmosphere longer than is necessary to make a proper examination; the prescription may be written and advice given in another apartment. After each visit he should carefully wash his hands, face, and hair; his hands especially should be washed in some disinfecting solution. He should then expose himself for a considerable time in the open air before visiting another patient. But if much time has been spent in the infected atmosphere he should certainly return home, wash again, and change his outer clothing. The clothing which is removed should be hung up in the open air for several hours. If the case be long and tedious, it would be advisable for the medical attendant to have his clothing disinfected after attendance has ceased, or even before, if

necessary. Far more preferable would it be for the physician to wear into the sick-chamber a long mackintosh or a linen duster buttoned up to the chin, and to keep the garment hanging in the open air in the intervals of his visits. In hospitals where there are many patients to be examined, and where he is required to spend considerable time in the wards, nothing short of a change of his entire outer clothing before leaving the institution would be advisable.

The isolation of a small-pox patient should be continued until all the scabs are removed, and even then he should not be allowed to associate with the public until he has had one or more antiseptic baths. Perhaps the most reliable antiseptic bath that can be given is one containing corrosive sublimate. The safest way to proceed in the use of such a bath is, I think, simply to sponge the body and carefully wet the hair with the solution (1 to 2000), and then have the patient freely bathed in plain water with the use of carbolic-acid soap. A 5 per cent. solution of Labarraque's liquid also makes a very reliable disinfecting bath. After this he should put on clothing which has not been exposed to the infection, or, if exposed, has been disinfected, and he may then safely mingle with the public.

Inasmuch as the body of a person who has died of small-pox is capable of imparting the infection, some precaution should be observed in regard to it. For instance, the body should be thoroughly wet with a solution of corrosive sublimate (1 to 500), or with a solution of chloride of lime in the proportion of 6 ounces of the drug to a gallon of water, or with some other equally powerful disinfectant ; besides, it should be wrapped in a sheet saturated with one of these solutions and buried at once. The preferable method of disposing of the dead from this disease is by cremation ; but this method is yet perhaps too strongly opposed by public sentiment to be practicable. It is not advisable to transport the corpse a long distance or from one city to another for burial, but if this be really necessary, it should first be placed in a metallic coffin hermetically sealed. In its burial, it should be put at least six feet under ground, and should not be disinterred unless absolutely necessary, and then only under sanitary supervision. The vehicle used for conveying the body to the grave should afterward be disinfected. It is perhaps unnecessary to say that the funeral should by no means be public.

After the sick-chamber has been vacated, either by recovery or death of the patient, every article it contains of no great value should be immediately burned. Everything else which will not be injured by the ordinary operations of the laundry may be safely and cheaply disinfected by immersion in boiling water for half an hour. It should be remembered, however, that the water must be maintained at the boiling-point for that length of time. But if it be impracticable to

subject such articles at once to the boiling process, they should be immersed for about four hours in some reliable disinfecting solution—such as mercuric chloride in the proportion of 1 to 2000, or carbolic acid 1 to 50—and subsequently boiled. Heavy clothing, pillows, hair mattresses, and other articles which cannot be boiled and washed should be hung up in the room and subjected to the influence of formaldehyde fumes or sulphur dioxide. The latter may be employed by burning in the room, after it has been made as nearly air-tight as possible, 3 pounds of sulphur to every 1000 cubic feet of air-space. The presence of moisture makes this process more effective. Formaldehyde in the form of formalin can be more conveniently used and is more efficacious. After the use of either of these agents, the room should remain closed from twelve to twenty-four hours, then opened, thoroughly ventilated, and all surfaces, including the furniture, washed with a disinfecting solution (chloride of lime, carbolic acid 1 to 50, or mercuric chloride 1 to 1000); afterward the floor and other wood-work should be thoroughly scrubbed with soap and water. The wall-paper, if there be any, should be well moistened with the carbolic-acid solution and scraped off and burned. Paper may be reapplied or the walls whitewashed, according to fancy. In addition to all these precautions, it is advisable to have the room remain unoccupied for three or four weeks, during which time it should be well aired.

For disinfection of outer clothing, carpets, bedding, and all articles which cannot be boiled, there is nothing superior to steam under pressure. The germs of small-pox will certainly perish if exposed for half an hour to this agent at a temperature of 230° F. There are, however, certain articles which would be injured by moist heat, and for the disinfection of these dry heat may be substituted. In this case a temperature of at least 230° F., continued for two hours, will be required. Formalin, however, could be used instead of dry heat.

As most of these requirements would be only indifferently carried out by the average citizen, and as some could not be attempted at all for the want of proper facilities, it is evident that local sanitary boards should be vested with authority and provided with ample means to take charge of every house in which small-pox makes its appearance, and apply the necessary measures for the eradication of the infection. The work of disinfection should always be conducted by a properly qualified sanitary officer, and, as it is done in furtherance of public safety, the public treasury should supply the means. In every large city, as has been so pertinently remarked by an experienced sanitarian,[1] some suitable place should be provided for disinfecting, without cost to the poor, and at a nominal cost to the well-to-do, all portable articles,

[1] Wm. H. Ford, M. D., President Board of Health of Philadelphia, "The Preventive Management of Small-pox," *Medical News*, March 11, 1882.

particularly such as cannot be conveniently or satisfactorily cleansed and disinfected at home, such as beds and bedding, woollen clothing, and the like. "Such articles," continues this sanitarian, "could then be removed with due precaution in a wagon specially prepared for the purpose; those of no value being burned in a furnace, and the remainder, after being cleansed and thoroughly disinfected by steam, dry heat, or by chemical agents, according to circumstances, returned to the owners. This plan will prevent serious embarrassment, and will ensure a more complete purification than can be expected under ordinary circumstances; and its general observance will unquestionably do much toward the preservation of the public health." In cities where this method has been adopted its benefits have been clearly proved.

In order to afford health authorities the earliest opportunity to apply any or all of the measures which have been indicated for restricting and preventing the spread of small-pox, every case of the disease should be promptly reported to them so soon as its nature is determined. In some municipalities the physician in attendance is required to give such notification—a requirement which, I think, is not unreasonable. Unquestionably, every practitioner of medicine should feel himself called upon to sustain the sanitary authorities in their efforts to prevent or stamp out a pestilential disease, and should willingly comply with any requirement whose object is the attainment of so desirable an end. Surely, no one who properly appreciates the dignity of his calling would connive at the concealment of a disease whose existence endangers the public health. It has been truly said:[1] "No obligation to the patient or his friends is required of the physician to keep the nature of the disease a secret; on the contrary, by so doing he lowers his profession and dishonors himself, in that he wrongs the public by pandering to the selfish interests of the few."

Treatment.

In the management of small-pox greater progress has been made in the direction of prevention than of cure. Since the general introduction of vaccination epidemics of this once widespread and fatal scourge have greatly diminished in frequency; hence opportunities for studying the course and treatment of the disease in the present age occur only periodically, and these periods are often widely separated. For this reason, doubtless, the current literature of medical science contains less in regard to the treatment of this than of most other infectious maladies.

The type of small-pox has also been very considerably changed by vaccination. Where this agent does not confer immunity from infection, it is still quite sure to exercise a more or less marked modifying influence over the disease, according as the period at which it was

[1] Ford, *loc. cit.*

employed is near or remote. Cases of small-pox thus modified are known as varioloid, and they may assume various grades of severity—from the mildest form possible to that barely distinguishable from the unmodified disease. In the management of the milder cases but little is required besides the employment of hygienic measures; the severe cases, however, demand very careful attention, and even then death not infrequently results. But even where the protective influence of vaccination seems to be entirely lost, there is often sufficient of this influence remaining to cause a slight abridgment in the course of the disease, and thus a severe case is often helped through to a favorable termination. It is therefore easy to understand how a certain drug, or some special method of therapeutics, may acquire an unmerited reputation in the treatment of post-vaccinal cases of small-pox.

Unmodified small-pox has always been a very difficult disease to manage, and the treatment, of course, has varied greatly in different ages. One of the earliest methods of treating the disease consisted in placing the patient in a bed surrounded with red hangings, covering him with red blankets and a red counterpane, having him suck the red juice of pomegranates, and gargle his throat with mulberry wine. It is said that Prince John, son of Edward II. of England, was treated in this way, and that his medical adviser took to himself no small credit for having brought his royal patient safely through the disease.

Later on, the treatment was for a long time equally erroneous, although not governed by the same superstitious belief. It was the practice for centuries to bleed largely and repeatedly, to purge, to blister, to apply heating lotions, to administer heating drinks, and to do many other irrational things. Without reproaching in the least our ancestors, who did the best they knew, their method of treatment cannot be too strongly condemned, since measures so depressing must of necessity cripple the powers of nature and add to the malignancy and fatality of the disease. More recently we have come to a recognition of the important fact that small-pox in its fullest development is so exhausting in its effects as to tax to the utmost all the resources of vital energy, and that it is our duty to conserve by every possible means the vigor of the patient.

It must be admitted that there is as yet no treatment capable of exerting the slightest influence in either shortening or modifying the course of small-pox. In view of the light, however, which is now beginning to dawn, it does not seem altogether visionary to believe that the time is approaching when we shall be able to introduce into the blood an agent capable of rendering the tissues unsuitable for the multiplication and growth of infectious microbes. Until this new era arrives, however, we must be content with a treatment based on rational principles.

PLATE II.

Well-marked case of chickenpox on fifth day, showing the lesions in various stages of development

In order to consider in detail the treatment of small-pox it seems most convenient to divide the disease into its various stages, as follows: 1. The Stage of Incubation; 2. The Initial Stage; 3. The Eruptive Stage; 4. The Stage of Suppuration; 5. The Stage of Retrogression, or Stadium Exsiccationis; 6. Convalescence.

The Stage of Incubation.—The interval between the reception of the infecting agent of small-pox into the blood and the earlier manifestations of disease is usually unattended by symptoms. There is no doubt, however, that certain unknown processes take place during this period. It is very important to know whether anything can be done at this time to arrest or change these processes so as to prevent or modify the approaching disease. Drugs, of course, are powerless for this purpose. Is vaccination at this period capable of exerting any such influence? This question has been answered in both the affirmative and negative. Some have advanced the opinion that when the micro-organisms of variola have gained access to the circulation the subsequent introduction of the micro-organisms of vaccinia can have no other effect than that of accelerating the action of the former. This opinion is based on the assumption that the micro-organisms of both these affections are identical. Hence, the few who hold to this view denounce vaccination at this stage of variola as not only useless but harmful, claiming that it tends to precipitate and intensify the incubating disease. I need only say that this view is altogether theoretical, and wholly unsupported by experience.

From the clinical reports of those who have made extensive use of vaccination at this period of small-pox there seems to be some difference of experience concerning its efficacy. In commenting on this question Curschmann says:[1] "Are we able to exert any influence on the disease in the early stage preceding the eruption? Is it possible in infected persons, during the stages of incubation and invasion, to cut short the disease or to modify its course? Many attempts have been made to answer these questions affirmatively, but as yet without much result. The first idea was vaccination, and this was employed by some in the ordinary way; by others subcutaneous injections of vaccine lymph have been given, it is said, with good results. I must, however, advise great scepticism regarding these assertions. Of the subcutaneous injection of lymph I have no experience; but that ordinary vaccination during the stages of invasion and incubation cannot stay the disease has been proved to me by chance observations and direct experiments. On the contrary, I have seen, in cases in which vaccination was practised after infection with variola, vaccine pustules and small-pox pustules developed side by side. It is, in my opinion, very doubtful whether vaccination can even render the course of the disease milder."

[1] *Cyclopædia of the Practice of Medicine*, Ziemssen, vol. ii.

The hypodermic use of vaccine lymph is certainly not entitled to any confidence as a prophylactic measure. Immunity does not result from the mere presence of the vaccine virus in the blood, but from certain unknown processes which take place in the system in the course of true vaccinia. It is therefore evident that the vaccine disease must reach a certain stage of development before it is capable of exerting any prophylactic power whatever. I have had very frequent opportunities of witnessing that vaccination during the invasive or initial stage of small-pox is utterly valueless, and also that it is equally valueless when performed only three or four days prior to the earlier invasive symptoms. A vaccine vesicle, resulting from a vaccination

FIG. 4.

A typical vaccine vesicle on the tenth day. (From photograph by Dr. Jay F. Schamberg.)

performed at the period just mentioned, and the variolus pustules, will, it is true, develop side by side without the one exerting any influence whatever over the other. But Curschmann's experience seems to warrant the inference that at no time within the incubation period of small-pox can vaccination be used with advantage against the approaching disease. If such is his experience, it certainly differs very greatly from my own. I have in numerous instances seen small-pox very markedly modified by vaccination performed at this period, and not infrequently have seen it prevented absolutely. In order that

protection shall be complete it is necessary that the insertion of the vaccine lymph should be made almost immediately after the reception of the contagium ; but if made at a somewhat later date a modifying effect may still be obtained. No part of the incubation period should be considered too late to make use of this remedy, since this period is sometimes prolonged beyond its usual limit, in which case a late vaccination may prove of value.

It is my opinion that vaccinia does not begin to exert its prophylactic power until the areola commences to form around the vesicle. At this time the mild febrile reaction, which was regarded by Jenner as *sine quâ non* in true vaccinia, becomes apparent. If this stage of the vesicle be reached before the patient shows any symptoms of small-pox, the disease may be entirely prevented ; if not reached until after the febrile symptoms appear, but before the eruption occurs, it may modify the attack. Now, it is well known that in typical vaccinia the areola appears about the seventh or eighth day from the date of insertion of the lymph, and is at its height on the ninth or tenth day ; and it is equally well known that the incubation period of variola is, in the majority of cases, of ten or eleven days' duration, and that the eruption does not appear until about three days later. This renders quite obvious the fact that vaccination, practised shortly after variolous infection has occurred, has an opportunity in point of time to exert more or less prophylactic influence against the incubating disease. While no inflexible rule can be laid down, yet it may be said in a general way that if vaccination be practised on the first or second day after reception of the infection into the system the protection may be perfect ; and if employed between this date and the fifth day, it may be partial. But I would emphasize the fact that after infection has occurred every day that is allowed to pass before resorting to vaccination is so much valuable time lost.

While the appearance of the areola generally indicates the period of the vaccine process at which its prophylactic power begins to be exerted, yet this period may vary somewhat in different individuals. For instance, I have more than once seen, say, two persons exposed to the contagion of small-pox at the same time and in such a manner that there could be no doubt about infection having occurred, have vaccinated these persons at once and with the same virus, and the vaccinia in both cases has pursued an identical course, yet in one the protection was perfect, while in the other it was only partial. In other similar instances one has received partial protection and the other none at all. This difference is doubtless due to some individual peculiarity that cannot be explained.

It is much easier to confer protection against small-pox after infection where revaccination is required to accomplish this result than where

the vaccination is primary. The explanation of this is not difficult. It is because vaccinia in its modified form, such as results from revaccination, develops more speedily, arrives at the areolar stage more quickly, and runs its entire course several days sooner than does unmodified or true vaccinia; hence it is clear that the period of protection in such cases must be reached earlier.

In endeavoring to confer protection during the incubation stage of small-pox the quality of the vaccine lymph employed has a great deal to do with success. I have never been able to succeed well with animal lymph preserved on ivory points. It is too unreliable, and when it does succeed in producing vaccinia the process is usually so slow that it does not reach the stage at which protection is exerted before the symptoms of small-pox appear. Nothing is of so vital importance at this period of the disease than that the vaccine virus employed should be fresh and active. The difference between succeeding and failing in producing vaccinia after exposure often means to the patient the difference between life and death. I know of no virus that is more reliable or will give better results than eighth-day lymph taken directly from a typical vaccine vesicle on the arm of an infant. But as this virus can seldom be obtained when needed for this purpose, next to it I prefer humanized virus in the form of crust from a healthy infant; and I have a very decided preference for that which has resulted from a long series of human transmissions. There is no question that vaccinia induced by such virus runs a much shorter course than that which results from animal lymph, or even from virus of recent humanization. The vaccine in use in this country prior to the introduction of animal vaccination (in 1870) gave rise to a decidedly modified type of vaccinia, whose duration, counting from the insertion of the virus until the falling off of the crust, was only fourteen or fifteen days. It is evident that vaccinia of this character is attended by a more speedy development of the vesicle and an earlier appearance of the areola than is the case in the more typical form of the disease, and consequently such virus can be used with greater effect against incubating small-pox. I need hardly say that where time is not so important an element, the vaccine which produces the typical Jennerian type of vaccinia is greatly to be preferred, for I believe it confers protection of greater durability.

There is no doubt that the milder type of vaccinia, or that resulting from long-humanized virus, is capable of conferring complete immunity against small-pox for a variable length of time. The best prophylactic results that I have had from vaccination after variolous infection have been from the use of such virus, and I attribute this wholly to its reliable and speedy action. In using this virus it is advisable that a number of insertions be made, as this not only

increases the chances of inducing the vaccine disease, but tends to bring the system more effectually under its influence. Furthermore, it is believed by some authors that multiple insertions quicken the processes of vaccinia, and thus hasten the attainment of that stage of the disease at which its prophylactic power begins to be exerted. Waterhouse was of this opinion, and his remarks on the subject are interesting because they were made nearly a century ago, in the very earliest history of vaccination. He wrote: "I think it proper to publish an important fact for which we are not indebted to Europe—namely, *If a person be inoculated with the kine-pock two days after having received the casual infection of small-pox, the kine-pock will predominate and save the patient.* Nay, I will go further and say in some cases *three days* posterior to infection instead of two; for there is a mode of expediting the operation of the kine-pock virus by increasing the quantity of matter thrust under the epidermis; and it appears, from experiment, that this does not depend so much on increasing the quantity put into a deep puncture as it does on the increase of infected surface. In other words, you may expedite the processes of kine-pock inoculation two days, if not three, if, instead of two punctures, you make sixteen or twenty;" . . . . "and on the sixth day from the operation we shall have the appearance of the eighth day in ordinary cases; and on the eighth day we shall find the appearance of the tenth, and so on with the febrile symptoms, in which commotion the prophylactic power consists."

As there is nothing at this stage of small-pox of greater importance than vaccinia attended by prompt and speedy development of the vesicle, it is evident that the virus employed should be selected and used with the greatest possible care and skill. Humanized crusts are not all equally reliable and active, and it requires more experience and closer attention to distinguish between those which can be trusted and those which cannot than is generally supposed. In order to ensure success, it is advisable to employ virus, when possible, from more than one source. It is desirable at this time to guard as far as possible not only against failure, but also against a vaccine disease of slow progress. A tardy vesicle, or one that is slow in making its appearance and late in arriving at maturity, gives no assurance of safety. From the use of bovine lymph, especially that form which is now furnished in a dried state on ivory points, it is not unusual to find the vesicles two, three or more days late in making their appearance, and correspondingly late in reaching the areolar stage. Such a vaccination, of course, could scarcely be expected to modify the approaching disease, much less prevent it. My recent experience with glycerinated lymph leads me to believe that it is much more certain and speedy in its results than dried bovine virus, and that it may prove equal in value to the long-humanized vaccine where promptness of action is desired.

The extent of my observation on vaccination during the incubation stage of small-pox amounts to 194 cases. The vaccinations were all primary, and were performed at various periods of this stage—anywhere from immediately after the reception of the infection until two days before the appearance of the eruption. As the cases were all under observation in the hospital where they came in the closest possible contact with small-pox patients, there can be no question that the contagium was present in sufficient quantity to ensure immediate infection.

Of the 194 cases, 38 were perfectly protected against small-pox, 16 almost perfectly protected, 31 protected to a well-marked degree, 30 partially protected, and 79 were unprotected.

In support of the statement already made—namely, that the vaccine disease does not begin to exert its prophylactic power until the vesicle has reached the stage at which the areola appears—I present the following statistics: Of the 194 cases, 61 were vaccinated on various dates ranging from one to seven days before the eruption of small-pox appeared, and of these 25 died, giving a death-rate of 40.98 per cent. In 124 cases vaccination was performed at an earlier period of the incubation stage, and of these only 16 died, giving a death-rate of 12.9 per cent. Of these 16 deaths, 13 occurred among persons who, before admission to the hospital, had been vaccinated with animal lymph, and the vaccine vesicles were in most instances of very tardy development. The value of vaccination during this stage of variola becomes still more apparent when these death-rates are contrasted with the death-rate of the unvaccinated cases, which amounted to 58 per cent.

The Initial Stage.—The initial stage of small-pox comprises the period between the earliest manifestations of disease and the appearance of the eruption, and has a duration usually of about three days. After what has been said of the power of vaccination after variolous infection, or of the hypodermic use of vaccine lymph, recommended by Furley,[1] it is needless to consider further either of these means as a remedy at this stage of the disease. Bloodletting, formerly so much employed, is now almost never resorted to, not even for the relief of symptoms. Quinine, in large doses, has been recommended as exerting a favorable influence over the course of the disease, but the experience of Curschmann and others show that it possesses no such value. In short, all attempts to stay the disease, or even modify its course, have proved unavailing, and we can do nothing more at this stage than treat special symptoms as they arise.

The popular though erroneous notion of past centuries, that it is necessary to keep the patient hot and sweating, still prevails to some

[1] *Lancet*, May 25, 1872.

extent, and not infrequently it is found very difficult to overcome this prejudice. On the contrary, every effort should be directed toward keeping the patient as comfortable as possible, and experience shows that a bed-room well ventilated and having a temperature of from 65° to 70° F. is best suited to this purpose. The ordinary febrifuge mixtures, such as liquor ammoniæ acetatis, liquor potassii citratis, tinctura aconiti, etc., may be given in suitable doses and at stated intervals. I am in the habit of using the following formula :

℞. Spirit. æther. nitrosi,
Syrupi limonis, āā. f℥iv ;
Liquor. ammonii acetatis, f℥v.—M.
Sig. Give 2 to 4 fluidrachms every two hours, in a little ice-water.

If there is irritability of the stomach, the effervescing citrate of potassium may be preferable. It sometimes happens that the stomach is very irritable, especially in children ; in this case lime-water, subnitrate of bismuth, aromatic spirit of ammonia, a little chloroform-water, or any other drug or agent known to be of service in this condition, may be used. The swallowing of small pieces of ice will often give relief when everything else fails. When the skin is hot and dry and the temperature high, frequent sponging with cool water is serviceable. Severe headache may call for the application of cold water, iced compresses, or an ice-bag to the head. These measures need not be feared on account of the popular impression that they tend to suppress the eruption, for such is not the case.

Nervous symptoms, such as insomnia, delirium, and convulsions, are often prominent features of the disease and demand appropriate treatment. Some one of the bromide salts, or chloral, given either separately or in combination, will usually succeed in subduing these symptoms. For the convulsions of children there is perhaps nothing more effective than chloral, given either by the mouth or rectum. When given by the mouth it should be well diluted, since it is very irritating to the throat, which is liable to become implicated in the variolous process quite early. Warm baths are also very useful. There is another nervous symptom commonly present at this stage of small-pox, and that is pain in the back. This is sometimes so distressing as to call for measures of relief. When the stomach is retentive Dover's powder may be given, or some one of the analgesic coal-tar products, now so frequently used to relieve pain. Sometimes there is a good deal of restlessness and general irritability ; in such cases I have found a little morphine, combined with the

febrifuge prescription given on the preceding page, to act most happily.

The common practice of applying mustard to the back for the relief of pain or to the epigastrium to lessen gastric irritability cannot be too strongly condemned, since the variolous eruption always appears in much greater abundance on irritated surfaces. Wherever there is an ulcer, a wound, or an excoriated condition of the skin, there the pustules are sure to be found in dense clusters. I have frequently seen the eruption intensely confluent over regions of the skin where a mustard-plaster had been applied during the initial stage of the disease. Some have thought that the eruption might in this way be diverted from the face to other localities, but I am convinced that it is not diminished anywhere else by reason of its confluence on these parts through the action of a sinapism; rather is it increased to that extent.

The digestion at this stage is not vigorous; hence the diet should be light and easily assimilated. There is nothing more suitable than animal broths and milk. The best beverages are cold water and iced lemonade. Acidulated drinks seem to be particularly grateful to the palate. Gentle cathartics may, of course, be administered whenever indicated.

The Eruptive Stage.—The eruptive stage may be said to comprise a period beginning with the first appearance of the eruption and ending when pustulation has fully occurred. The duration of this stage in variola vera is usually about seven or eight days, but in modified small-pox it is shortened in proportion to the degree of modification. The great desideratum for this period of the disease is a remedy capable of diminishing or modifying the cutaneous manifestations, for there is no doubt that recovery of the patient almost always depends upon the quantity of the eruption and the length of time consumed in running its course. Formerly it was thought that some modification might be brought about by bloodletting, but experience shows that the most confluent eruption has succeeded the most vigorous employment of the lancet. It is therefore worse than useless to bleed, for by so doing we expend power that will be required later on to repair the injury done by the disease.

In order to control the course of the disease it is necessary to find some agent capable of antagonizing its pathogenic forces. Efforts have been made to accomplish this end by the internal and external use of various antiseptic or antizymotic drugs, and some of these have been vaunted as efficacious; but it must be truly said that no one of these drugs has as yet established for itself the claims put forth respecting its value. I have experimented with a few of the antiseptic remedies which have been highly recommended from time to time, but with results so discouraging as to lead at once to their abandonment. A few years

PLATE III.

Moderately severe form of smallpox in an unvaccinated negro on the eighth day of eruption. Semi-confluent on face, discrete on trunk and extremities. (From photograph by Dr. J. F. Schamberg.)

ago I subjected 7 patients suffering from unmodified small-pox to the use of sulpho-carbolate of sodium, administering 20 grains every three hours: 4 of this number began taking the drug on the second day of the eruption; of these, 1 expired after three days, 1 after five days, 1 after eight days, and the other at the end of fifteen days of the treatment. Two began its use on the fourth day of the eruption; of these, 1 died in two days, and the other in three days. One began its use on the fifth day of the eruption, and in twenty-one days death occurred. It is seen that every one of these patients died. To be sure, they were all severe cases—all of them confluent, and some malignant. But they certainly represent a class of cases in the successful management of which something more than the ordinary treatment is required, which requirement is evidently not met by the antiseptic properties of sulpho-carbolate of sodium.

Besides the drug just mentioned, I have tried a few other antiseptic remedies, such as salicylic acid, salicylate of sodium, and carbolic acid; the latter both internally and externally. But I cannot say that I have seen beneficial results from the use of any of these drugs. With xylol—which, according to Zülzer, coagulates the contents of the pustules and cuts short their development—I have had no experience.

The internal use of sulphur has been favorably mentioned as a remedy. From the fact that this drug is eliminated by the skin it has been thought that it ought to be peculiarly beneficial in the treatment of small-pox. Dr. Iscar, of France, claims that he has used it with success, and recommends for children the following formula:

℞. Sulphur. lotum, ʒiiss;
Glycerini,
Aquæ aurantii flor., āā. fʒxv;
Syrupi simplicis, fʒviiss.—M.

Dose, a tea-spoonful every hour.

The local use of antiseptics in variola is also spoken of very favorably by some writers, particularly M. Bianchi, who reports excellent results from the following method: The patient is first bathed in a solution of 1 : 20 of boric acid, using with this bath antiseptic soap. During the course of the disease, baths in the boric-acid solution, or in a solution of corrosive sublimate 1 : 1000, are used every four hours. After each bath the patient is anointed with iodoform and vaseline, from 1 to 5 : 100, according to the severity of the case. When possible the pustules are opened with an "aseptic needle" and their contents evacuated. The patient is then wrapped in aseptic linen, which is frequently changed. It is claimed by the author that this treatment notably

diminishes the duration of the eruption, lessens the fever, prevents severe ulceration and scarring, and thus leads to rapid convalescence. Similar results are said to have followed the use of baths containing permanganate of potassium, the salt being added until the water is of a rose-red color.

Corrosive sublimate has also been recommended locally in the form of spray. Talamon employs what has been styled, "the sublimate-ether spray," which I believe is prepared as follows:

℞. Hydrarg. chloridi corrosivi,
Acid. tartarici, āā. gr. xv;
Alcoholis (90 per cent.), ʒiss;
Ætheris, q. s. ad fʒiij.—M.

This is to be used two or three times daily with a hand-atomizer, and, as it is caustic, care must be taken not to throw it into the eyes, nor in proximity to the nostrils of the patient.

Looking back over the literature of the subject, I find that the antiseptic treatment of small-pox by means of external applications is nothing more than the revival of an old practice that was employed and abandoned many years ago. It is true that when these agents were used a half century and more ago, it was not because they possessed antiseptic properties, for the germ theory was not then known; but ignorance of this fact certainly could have made no difference in the result. As long ago as 1843, Gregory wrote:[1] "The latest mode of treating the surface during the maturative stage of small-pox is that of applying mercurial plasters containing calomel or corrosive muriate of mercury, or covering the whole surface with mercurial ointment. In the French hospitals at the present time the latter mode is in fashion. The reports which have reached me of its success, however, are not very flattering. I have seen all three plans fairly tried at the Small-pox Hospital. The ointment and calomel plasters were inefficient. The plaster of corrosive sublimate converted a mass of confluent vesicles into one painful and extensive blister, but I am still to learn what benefit the patient derived from the change."

Until some special treatment for small-pox is proved efficacious, we cannot do better than treat this stage of the disease on the same principle as the preceding one—by regulating the condition of the patient and giving attention to special symptoms as they arise. Usually it is not until the eruption appears that the disease is recognized and its severity prognosticated. If the case promises to be at all severe, all flannel under-garments should be at once removed, and the hair cut close, so that the head may be kept cool, cleanliness enforced, the risk

[1] Gregory on *Eruptive Fevers*, Bulkley.

of cellular inflammation of the scalp diminished, and a better opportunity afforded for the employment of cooling lotions should delirium or more urgent brain symptoms arise.

The febrile symptoms which usher in the disease now usually remit, but increase again as the eruption progresses. For this condition the remedies already mentioned may be continued. It sometimes happens in a depressed condition of the system, particularly in children, that the extremities and even the surface of the body are cool, and that the eruption is too slow in making its appearance. In such cases the application of heat and the administration of hot stimulating drinks, such as hot toddy, may be of service. This condition in children is apt to be associated with convulsions, in which case there is nothing better than a warm bath, followed by an envelopment in warm blankets. Should the convulsions continue, however, chloral, by either the mouth or rectum, is quite sure to give relief. I repeat here the caution not to fail to dilute the chloral freely, for the throat is now so much involved in the variolous process that an irritating draught may give rise to croupous symptoms, or even acute œdema of the glottis.

As the eruption progresses, not only the fauces, but the soft and hard palate, the buccal mucous membrane, the larynx, and sometimes the trachea, also become more or less involved in the process, and this is often the source of difficult and painful deglutition. This condition requires the use of mouth-washes and gargles, such, for example, as those containing chlorate of potassium, boric acid, glycerole of tannin, tincture of myrrh, etc. I have often found the milder demulcent fluids made from flaxseed, gum arabic, or slippery-elm bark with water particularly palliative. Of these, none are more relished by the patient than flaxseed tea, sweetened with white sugar and acidulated with lemon-juice. Careful and frequent cleansing of the mouth affords considerable relief. This may be done by the nurse covering her index finger with a soft linen rag, dipping it into a little sage tea, or solution of boric acid with glycerine added, and then thoroughly and carefully cleansing the entire buccal cavity. Sometimes it is found more convenient to use some of the mouth-washes mentioned above in the form of spray. All irritating washes, such as caustic solutions of nitrate of silver, and the like, should be carefully avoided.

When the eruption assumes the vesicular form, there are always considerable burning and itching of the skin, particularly of the face, hands and forearms. For the purpose of preventing or alleviating these symptoms, some ointment or oily substance may be applied. Vaseline containing about 3 per cent. of carbolic acid makes a very useful ointment; or, if the odor of carbolic acid be objectionable, oil of eucalyptus or thymol may be substituted. The preparation which

I most frequently employ is one composed of equal parts of lime-water and olive oil, to which I sometimes add an antiseptic, and at other times a little cologne-water. This I have applied very freely with a large camel's-hair brush. When the burning sensation and pain are severe there is perhaps nothing that gives so much relief as cold applications, such as cloths wet with cool water and spread over the face and arms. Curschmann believes that cold and moisture are the most efficient remedies for this condition. He says :[1] "In severe cases the application of iced compresses to the face and hands, or to any parts where the eruption is abundant, will diminish the severe pain, lessen the swelling and redness of the skin, and make the patient more comfortable."

The development of the eruption in the thick skin of the palms of the hands, tips of the fingers, and soles of the feet, not infrequently gives rise to intense pain. Cold applications or iced compresses may prove of service in this condition, although I think I have seen greater relief follow the prolonged use of lukewarm hand- and foot-baths. The frequent application of flannel cloths wrung out in tolerably hot water, or the use of hot poultices, is often of great service.

Toward the latter part of this stage of variola persistent insomnia and violent delirium often occur. When this condition of the patient is attended by a flushed face and bounding pulse, an ice-bag to the head and a brisk cathartic may be of service. Tartar emetic and sulphate of morphine, in doses of from $\frac{1}{8}$ to $\frac{1}{2}$ grain each, will sometimes produce sleep and quiet the delirium. Large doses of bromide of potassium, or chloral freely diluted, may be given, and repeated if necessary. Some care, however, must be taken not to push these remedies too far, lest the patient lapse into coma or a state of profound prostration.

Occasionally, the delirium is of that violent kind which the older writers styled "*delirium ferox.*" This is accompanied with a wild expression of the countenance, and such a strong tendency to escape from the attendant, or to self-destruction, that too much care cannot be exercised for the safety of both the nurse and the patient. I have known strong and muscular patients while in this state of mind to knock the nurse down, jump out of the window, and run to some secluded place, where they would cunningly secrete themselves. I have also known patients to attempt suicide in various ways while the nurse was temporarily absent. The necessities of the case, therefore, often require the use of some artificial means of restraint. For instance, a wide band of stout webbing or canvas may be placed loosely over the patient's chest and firmly secured to each side of the bed. Smaller bands of the same material may be fastened to each

[1] *Loc. cit.*

PLATE IV

Smallpox in an unvaccinated negro on the eighth day of eruption. Confluent on face, semi-confluent on extremities, and discrete on trunk. (From photograph by Dr. Jay F. Schamberg.)

wrist and ankle, the former being secured to the sides of the bed, and the latter to the foot of the bed, allowing, however, a little motion of the limbs, so that the patient shall not be subjected to painful restraint. In the mean time every effort should be continued to quiet the delirium, and when the patient refuses to swallow, the drugs and nourishment should be administered by the rectum.

It is deemed appropriate to speak of the treatment of hæmorrhagic small-pox under this head, for the peculiar manifestations of this type of the disease become strikingly apparent during the eruptive stage; and, moreover, it is rare for a well-marked case to live beyond the limits of this stage. Treatment is of little avail in this phase of variola. The remedies usually employed are acids, quinine, ergot, and tincture of chloride of iron; but these, I think, are prescribed more in conformity with general usage than with the expectation of obtaining any real benefit. When hæmorrhage takes place into the various cavities or internal organs of the body, it is recommended that styptics be employed, together with injections of ice-water, or the use of cold compresses or tampons, although it is admitted that the beneficial effect of these agents is very slight. Transfusion has been tried, but has not given very encouraging results.

This type of the disease in varioloid is not quite so significant of danger as in variola. I have seen a few hæmorrhagic cases of varioloid in which the hæmorrhage from internal organs was not very profuse or protracted, although the spots of petechiæ and purpura were well marked, recover under the free use of iron and stimulants. In these cases nourishment was taken freely, prostration was at no time profound, and, as the patients passed favorably through the eruptive stage of the disease, the petechiæ and purpura gradually disappeared and convalescence became established.

The most appropriate diet during the eruptive stage of variola is a liquid or soft diet. It should be easy of digestion and very nutritious, for the patient has yet to pass through a severe ordeal, in which his power of endurance will be tested to the utmost. Such articles as animal broths, milk and eggs may be freely given. Bread may be added to the broths or to the milk, or it may be given in the form of milk-toast. In varioloid, the appetite during this stage is often unaffected; such patients require but little treatment, and may be allowed almost perfect freedom in choice of diet.

The Stage of Suppuration.—As the eruption advances from the papular form, it next becomes vesicular, and then from the admixture of pus-corpuscles the vesicles gradually grow more and more turbid until they become completely purulent; it is now that the disease enters the stage of suppuration. In variola vera this stage begins about the eighth day of the eruption, and continues until the eleventh, twelfth, or

thirteenth, when desiccation commences. Its duration, therefore, is from three to five days. It is at this stage of the disease that the eruption attains its greatest development; that the suppurative, irritative, or so-called secondary fever occurs; that the mucous membrane of the mouth, fauces, and larynx becomes most dangerously involved; that the vital forces of the patient are put to the severest test, and his life is placed in the greatest jeopardy. The largest number of deaths by far occur during this period. The indications for treatment are to mitigate the fever, to disinfect the exudation from the skin, to relieve the dangerous throat symptoms, and to resist by every possible means the tendency to death from exhaustion. If the patient's life can be prolonged through this stage, his chances for recovery increase with each succeeding day.

The febrile reaction, which had abated considerably when the eruption first appeared, now increases to a notable degree, often reaching a greater elevation than existed during the initial stage. In *variola confluens* the temperature at this period of the disease usually ranges from 103° to 106° Fahr. Various drugs and other means have been employed for the purpose of reducing the intense heat of the body, but none of them have given results entirely satisfactory. Quinine has been recommended, but in order to exert its antithermic properties it must be given in doses of 10 grains, repeated every half hour or hour until 40 grains have been taken. This usually produces effects so unpleasant that I seldom give it in antipyretic doses. I use it, however, quite freely as a tonic, and also on account of its favorable action in preventing septicæmia. Some one of the antipyretics of the coal-tar series may occasionally be found useful. There is no doubt about the power of either antipyrine or acetanilid to reduce temperature, but I do not feel sure that the use of these drugs in all cases is unattended by risk. However, when used carefully and in selected cases I do not think the risk is very great. Of the two, I prefer acetanilid. According to my experience, a single dose of 10 grains of this drug to an adult, causes, quite uniformly, when the temperature is high, a reduction of four degrees within four hours; but during the following four hours the temperature returns again to where it was before the drug was taken, and sometimes even runs a little higher. During this short respite from intense fever, the patient is often able to take a little more nourishment than he would otherwise do, and sometimes enjoys an hour or two of refreshing sleep. Smaller and more frequently repeated doses of either of these, or some other product of the coal-tar series, may prove more satisfactory.

Cool immersion baths, which have been recommended so highly in Germany for reducing high temperature in typhoid fever, have not

met with anything like the same favor, even in that country, in the treatment of variola. Apart from the difficulty of getting a patient while in the pustular stage in and out of the baths, it is said that they do not afford much relief. Cold compresses, and cool water squeezed from a sponge over portions of the body, are more easy of application, and are very often serviceable. I have seen patients temporarily benefited in warm weather by covering them with a sheet wrung out in cold water and renewing it every few minutes; but usually this treatment is not well borne for any great length of time, nor is it at all well borne in cold weather. Kaposi, I believe, recommends the application of cloths or compresses moistened with tepid water. The choice between the use of cool or tepid water should depend largely upon the season of the year and the sensations or temperament of the patient. Of course, during this treatment the clinical thermometer should be used frequently in order to note the reduction of temperature that follows.

The topical applications recommended for the pustular condition of the skin are very numerous. To assuage the pain, burning and itching, to correct the offensive odor, to guard against septicæmia, and to prevent pitting, are the principal ends aimed at in the selection of these measures. Remedies for the alleviation of the pain, burning and itching need not be different from those recommended for the same purpose in the preceding stage. Indeed, most of the local remedies already described, while they have no power to abridge the course of the eruption, are nevertheless among the best for any or all of the conditions above mentioned.

During the period of suppuration the sensation of itching is quite as intolerable as the pain, so that it is almost impossible for the patient to refrain from scratching; and in consequence of this, or from other causes, the pustules become ruptured in many localities and their contents discharged. This purulent matter undergoes decomposition wherever it is found, whether in the soiled bedding and clothing or upon the skin of the patient, and consequently gives rise to a highly offensive odor. Remedies are demanded for this condition, not only because of its offensive character, but also because of its liability to lead to septicæmia. Antiseptic washes may be used, such as a solution of boric acid (1 : 20), of carbolic acid (1 : 100), or of corrosive sublimate (1 : 1000). I need hardly say that the latter should be used with some care, particularly about the mouth, nose, and eyes. A very convenient method of using such solutions is in the form of spray. The "sublimate-ether spray" already referred to may be of service at this time. A saturated solution of boric acid in rose-water may be used freely and without any fear of evil consequences, even if it should get into the eyes, nose, or mouth. I frequently employ a 5 per cent. solution of

either carbolic acid or Labarraque's liquid, directing that both the patient and the bedding shall be sprayed with this solution every little while.

For attaining the same end, some one of the antiseptic oleaginous preparations recommended in the early stage of the eruption may be continued. I do not know of anything better than equal parts of olive oil and lime-water and a little carbolic acid or oil of eucalyptus (olive oil and lime-water each $\frac{1}{2}$ ounce, carbolic acid from ten to fifteen drops). This should be applied with a camel's-hair brush to the face, hands, and forearms two or three times daily. According to some authors, much relief and benefit have followed the use of an ointment made of lard and liquor sodæ chlorinatæ in the proportion of 1 ounce of the former to 2 drachms of the latter. This is to be freely applied at short intervals to the face and other much-involved parts. Very excellent results also are said to have followed the use of an unguent composed of 100 parts of cold cream to 4 parts of salicylate of sodium. M. Dujardin-Beaumetz reports that this ointment, in his hands, has not only been successful in destroying the repulsive odor in severe cases of small-pox, but has actually prevented suppuration. His method of using the ointment is to rub it over the face and other parts of the body where the eruption is most abundant; and, in addition, he advises that a powder of 100 parts of talc to 6 parts of salicylate of sodium be dusted over the affected localities. I have sometimes been able to lessen or modify the horrible odor by using as a dusting powder subnitrate of bismuth, boric acid, and, sparingly, iodoform. To either of these, and especially to the latter, talc might be added. I have also derived advantage from a dusting-powder composed of 15 to 20 parts of aristol to 100 parts of talc.

Various, indeed, are the methods that have been recommended for the prevention of pitting in small-pox, and yet I think it can be truly said that no one of them has stood the test of experience. From the unmodified form of the disease disfigurement is as great and as much dreaded at the present time as it was in the days of our ancestors, and it seems probable that this will continue to be the case until some agent is found capable of causing the eruption to abort before it reaches the pustular stage, for the suppurative process at this stage is attended with destruction of derm tissue, and consequently scarring must follow. If any ectrotic measure were reliable, it would be easy by its employment to limit the amount of cutaneous inflammation and suppuration, to lessen, if not prevent, the so-called secondary fever, and thus obviate the danger from exhaustion. Hence, such a measure would serve the double purpose of saving life and preventing pitting.

Of the various ectrotic measures recommended, I shall refer only to those which are spoken of most favorably. Opening the vesicles

PLATE V.

Variola on the Eighth Day of Eruption. Confluent on Face and Semi-confluent on Extremities.

with a fine needle and evacuating the contents is a method advocated by Rayer and others. Also evacuation of the vesicles, followed by cauterization by means of a fine-pointed stick of nitrate of silver, has been highly recommended, especially by Velpeau, Bretonneau, and others. The exclusion of light and air from the skin is said to have prevented pitting. The Egyptians and Arabs sought to accomplish this by covering the face with gold-leaf; and others, more recently, by covering the face with certain dark-colored plasters. Collodion has had its advocates. If useful at all, I think flexible collodion would be preferable. A solution of gutta-percha in chloroform has been recommended by such authorities as Stokes, Graves, and Wallace. In using either of the two latter preparations it is advised that they be applied to the face once or twice daily with a camel's-hair brush, and that the applications be commenced while the eruption is still papular, or while the vesicles are quite small. These agents are supposed to act by excluding the air and by the mechanical pressure they exert. Tincture of iodine, applied in the same way and at the same period of the eruption, has been highly recommended. Sargent is said to have tested the ectrotic power of this agent in thirty cases of small-pox, the application having been limited to one side of the face. According to the description given of the results, there was not so much swelling where the iodine was applied, the vesicles were flattened, and, while the pitting was not prevented, it was perceptibly diminished. Lemaire and Sansom claim to have used successfully carbolic acid diluted with alcohol. This was applied as soon as the vesicles began to assume a purulent form. Certain merit has been claimed for subnitrate of bismuth and prepared chalk, in equal parts, when applied twice daily in connection with sweet oil. Sulphur ointment (from $1\frac{1}{2}$ to 2 drachms to 1 ounce of lard), rubbed lightly over the affected parts three times daily, has been recommended as useful in preventing suppuration of the vesicles, and thus saving the skin from disfigurement. Mercury has perhaps been more highly praised than any other ectrotic remedy. It has been employed in different forms, both as a plaster and as a wash. M. Briquet was in the habit of using a mask composed of mercurial ointment and sufficient powdered starch to solidify the mass, so that it could be moulded to the various parts of the face. He renewed this application once or twice a day. The French physicians have been very partial to a compound mercurial plaster, known in the French Pharmacopœia as "plaster of Vigo." It has been claimed that if this plaster be applied over affected surfaces before the fifth day of the eruption, the papules either disappear by resolution or change into vesicles or tubercles. According to M. Briquet, the latter change seldom takes place except on the face. It is recommended that the plaster be kept on from eight to twelve days. When removed it is said

that only small, hard excrescences are seen, and that these disappear in ten or twelve days without leaving any scars. It is admitted that ptyalism has been known to occur from the use of this plaster. Hence Bennett was led to substitute for the mercurial plaster calamine saturated with olive oil, which he found effective. A solution of corrosive sublimate (1 grain to 6 ounces of distilled water, with 1 drachm of laudanum), applied by means of compresses, is said to have caused the pustules to disappear without much ulcerative action. This application was recommended and used nearly fifty years ago. More recently Niemeyer recommended the employment of a solution of about the same strength (corrosive sublimate 1 grain to water 6 ounces). Skoda and Hebra advise that the compresses be dipped in a much stronger solution (grains ij–iv to water ℥vj). Still other measures have been highly lauded for this purpose, but I shall not consume time and space by referring to them.

The results which, in my experience, have followed the use of so-called ectrotic measures have by no means been encouraging. I have never seen any perceptible impression made on the eruption from the application of mercurial ointment. Tincture of iodine in my hands has not only failed to do what is claimed for it, but, on the contrary, has aggravated the inflammatory action of the skin and increased the suffering of the prtient. In the confluent variety of small-pox, where the liability to facial disfigurement is greatest, it is, of course, most unreasonable to talk about evacuating and cauterizing the vesicles. I have tried this plan in the mildly discrete form of the disease, and found that it gave some relief by lessening the sensation of tension that is commonly experienced in the locality of the pustules, but it did not prevent pitting. The application of collodion or a solution of gutta-percha in chloroform cannot, I think, be too strongly condemned. Such applications are objectionable in the first place because they form an impermeable coating, thus preventing exhalation from the skin, which adds to the discomfort of the patient. In the second place, they are objectionable because they render the surface of the skin over which they are applied so dense and unyielding as to cause an increase of pain in that part during the growth of the vesicles. In other words, the pain is increased by these agents on the same principle that it is rendered more intense in the soles of the feet and tips of the fingers when the eruption is developing there, where the skin is naturally hard and unyielding. Apart from all this, I would condemn these agents because they have utterly failed in my hands to accomplish the purpose desired. This is not only true of collodion and gutta-percha, but of all the measures I have employed. Hence, I feel about this matter of preventing disfigurement very much as Gregory did

when he wrote :[1] "There is no peculiar method which can be devised for the prevention of pits and scars. The masks and ointments formerly in use for that purpose, and so highly vaunted, are, in reality, more hurtful than beneficial. The application of a little cold cream to the hardened scabs is all that can be recommended."

The throat symptoms which appeared in the preceding stage of the disease now usually become greatly aggravated, especially in the confluent form of variola, where the eruption upon the mucous membrane of the mouth and fauces is generally also confluent. It is therefore necessary to continue the mouth-washes, gargles, and sprays previously recommended. It must be remembered that the eruption never presents itself on the mucous membrane so distinctly vesicular or pustular as on the skin, but assumes a pseudo-membranous or diphtheritic appearance. Hence the buccal surface and fauces often look as if they were covered by true diphtheritic membrane, but which is rather a necrosis of the epithelial layer. This condition may extend to the posterior nares, pharynx, and larynx, causing pain, fœtid breath, difficulty in swallowing, and sometimes all the symptoms of diphtheritic croup. Benefit may be derived by using freely a solution of chlorate of potassium, alum, or borax as a mouth-wash or gargle. Curschmann recommends a weak solution of liquor ferri chloridi. When there is much fœtor from these parts some antiseptic, such as carbolic acid, permanganate of potassium, and the like, should be added to the mouth-wash or gargle. I have found diluted chlorine-water to answer a good purpose. If it be impossible for the patient to rinse out the mouth or use the gargle, the nurse should thoroughly cleanse the mouth and throat in the manner already described, and then apply to the parts an astringent or antiseptic spray. The nasal cavities should also receive similar treatment.

The pain in the throat and the difficulty of swallowing are often greatly benefited by having the patient hold in his mouth small pieces of ice and allowing these to dissolve slowly. Mucilaginous drinks, either warm or cold, are always grateful to the palate. As already stated, there is no drink of this kind more relished by the patient and more palliative than flaxseed tea containing lemon-juice. When the pain and swelling in and about the throat are intense, the application of the ice-bag externally is sometimes beneficial. On the contrary, some patients are benefited more by hot applications, such as poultices. Should acute œdema of the glottis or of the ary-epiglottic folds occur, an emetic may be given if the patient is not too weak to bear its action, or local scarification may be practised. When suffocation threatens, tracheotomy offers the best, if not indeed the only chance for recovery.

The eyes often require attention at this period of small-pox. Oph-

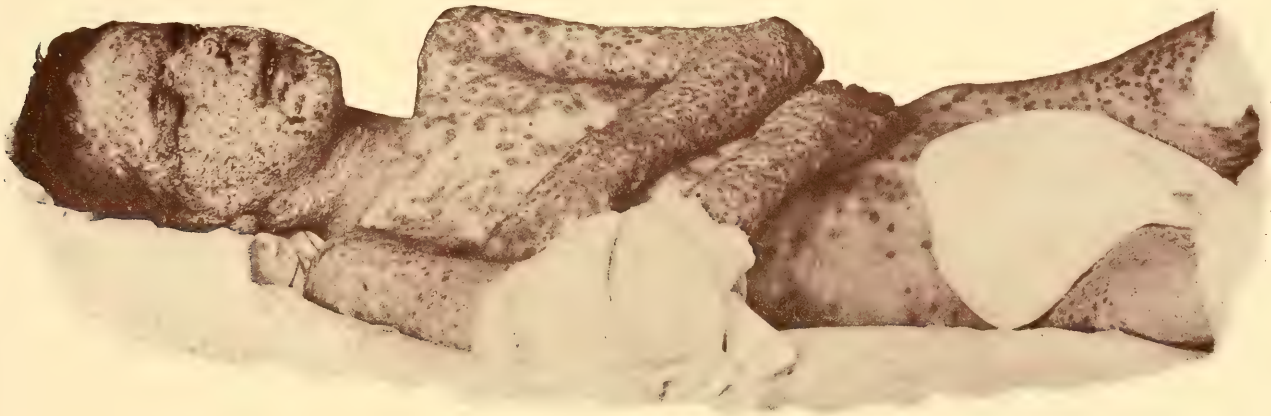
[1] *Loc. cit.*

thalmia in its more serious and destructive form, however, usually does not appear before the commencement of the retrogressive stage of the eruption, and sometimes even later. At this (the suppurative) period there is always a good deal of inflammation of the lids and lachrymal apparatus; the lids, indeed, are often so much swollen that they cannot be opened, and pus may be seen oozing from their margins. The nurse should be instructed to wipe away the pus as fast as it forms, and to apply to the parts frequently a saturated solution of boric acid and rose-water. Compresses wet with either warm or cold water may be kept constantly applied.

It is at this stage of the disease that the vital forces of the patient are put to the severest possible test. The prostrating effects of the vast irritation and profuse suppuration from the innumerable pustules must necessarily be very great. Watson has estimated the quantity of pus thus generated as amounting to quarts. A drain upon the blood so extraordinary as this demands that the strength of the patient should be vigorously supported; otherwise evidence of exhaustion soon becomes apparent. The first evidence of flagging of the vital powers is often seen in the subsidence of the redness and swelling of the face and hands: the skin becomes pale, the pustules present a shrunk or collapsed appearance, and the pulse grows rapid and feeble. Other symptoms indicative of exhaustion are subsultus tendinum, general tremors, a dry tongue, and delirium. These are always indications for the most liberal use of stimulants and nutritious and easily-assimilated food. It is wiser, however, not to wait until the vital energies begin to flag before resorting to supporting measures. As the patient approaches the suppurative stage his strength should be preserved by constant reinforcement, so as to enable him to encounter the struggle that is to follow. Contrary to what was formerly believed, the sthenic condition in this disease is not to be feared; rather is it desirable.

It is my practice to commence with stimulants and nutrients at the beginning of the suppurative stage, or earlier when deemed necessary. The method of their employment is about as follows: To an adult patient suffering from the confluent variety of the disease I direct that there shall be given in each twenty-four hours not less than 2 quarts of unskimmed milk, two to four eggs, and 6 to 12 ounces of whiskey; the latter being given usually in the form of milk-punch. The eggs should be well beaten and drank with the milk (a little salt being added), or they may be given in the form of egg-nog. It is important that the nutriment be given at short intervals, since patients can seldom take a large quantity at one time. It is also important that the stimulants and nutrients should be faithfully continued during the night, for many a patient when greatly

PLATE VI.



Confluent Variola on the Fourteenth Day of Eruption. Showing a Collapsed Condition of the Pustules and Commencement of Desiccation.

prostrated has sunk beyond recovery during that time, especially between midnight and morning, for the want of these measures.

In selecting the diet and stimulants we should, of course, take into consideration the condition of the patient's stomach. If that organ should be very weak, or disinclined to receive in sufficient quantity the nutritive material just referred to, or if there should be a great repugnance to milk, as is sometimes the case, such articles as bouillon with eggs, a well-prepared beef-tea, nutritious broths, and liberal amount of wine should be given instead. As a stimulant for patients in profound prostration Curschmann says a very good preparation is the Stokes cognac mixture:

℞. Cognac opt.,
Aquæ dest., āā. f℥xv;
Vitelli ovi, No. 1;
Syrupi, f℥vj.—M.
Sig. A table-spoonful every two or three hours.

I would suggest that this preparation might prove more efficacious if repeated more frequently, or given in larger doses.

In the way of drugs, quinine in tonic doses—2 grains every three or four hours—is, I think, of service at this stage of the disease. Digitalis seems to be indicated at times to steady the action of the heart, but if there be evidence of collapse or cardiac failure, carbonate of ammonium should be given in addition to the alcoholic stimulants, together with strychnia hypodermically. When the patient is very restless or suffers from insomnia, which not infrequently happens, anodynes may be cautiously given, either by mouth, rectum, or hypodermically, if deemed preferable. Delirium, which is often most prominent during this stage, should be treated in the manner already described. No more medicine should be given than is absolutely necessary, for the less the stomach is taxed with the ingestion of drugs, and the more entirely it is given over to the work of sustaining the vital forces of the body, the better will be the chances for recovery.

The question of administering cathartics during this stage of small-pox is one of some importance. According to Gregory, one of the most remarkable disputes that ever occurred in medicine was on this very question. The Arabians strongly opposed their use; Sydenham never regarded them with any favor; Morton inveighed bitterly against their employment; but Friend, assuming the position of a reformer, advocated their free use, especially during the period of suppurative fever. About this time, it is said, a young nobleman fell ill with confluent small-pox, and Friend, together with two physicians who held to the opposite side of the question, were called to treat him, and, in

the language of Gregory,[1] "The arguments in the consulting-room were long and stormy. The patient died, in spite of the purgatives which Dr. Friend's pertinacity had at length induced his colleagues to agree to. A paper war succeeded, and from words the parties came to blows. In June, 1719, Dr. Mead and Dr. Woodward met in Cheapside, drew their swords, and, after a few passes, Mead came off victorious. This display effectually settled the dispute, and purgatives are now as freely employed in the secondary fever of small-pox as in ague or typhus. They are of the greatest service when the skin is hot and dry, when a scarlatinal rash covers the body, or innumerable abscesses give evidence of the excited state of the cutaneous vessels."

I cannot agree with Gregory and others who recommend purgatives at this stage of the disease. My experience leads me to believe that the use of such agents is often attended with great risk. They are not only exhausting in their effects, but they temporarily interfere with the processes of digestion and nutrition, and such interference is often sufficient, especially when the life of the patient is, as it were, hanging in the balance, to decide the issues of the case unfavorably. When the bowels are constipated a mild laxative may be administered, or, what is preferable, a simple enema may be given.

The Stage of Retrogression, or Stadium Exsiccationis.—The stage of retrogression is characterized by drying of the pustules, lessening of the pain, diminishing of the swelling and redness of the skin and of the involved mucous membrane. The eyes again open, the nasal passages become more patulous, swallowing is less difficult, and the countenance, in favorable cases, assumes a brighter and more hopeful appearance. This stage, in unmodified small-pox, usually begins from the eleventh to the thirteenth day of the eruption, and runs very gradually into the stage of convalescence. In cases somewhat modified it commences a little earlier. During the greater part of this period the same general treatment recommended for the preceding stage should be continued. When, however, the patient shows well-marked indications of improvement, the quantity of stimulants may be gradually diminished, and such articles as corn starch, milk-toast, soft-boiled eggs, cup custard, and the like may be added to the diet. Quinine and some ferruginous preparation, especially the tincture of the chloride of iron, are particularly valuable at this time.

The treatment required for the skin, especially during the early part of this stage, does not differ from that already described. If the peculiarly offensive odor has not been noticed before, it is quite certain to appear now and become very prominent. It arises from the exudation of a yellowish, viscid fluid upon the surface of the pus-

[1] *Loc. cit.*

tules, forming a rough coating. The antiseptic washes, ointments, or powders should of course be continued as long as this condition exists. These remedies, particularly the ointments, are also useful to quiet the intense itching which at this period of the disease takes the place of pain.

Complications.—The complications in small-pox are very numerous, and this is the stage of the disease in which they are peculiarly liable to occur. Of these, furuncles, abscesses, and various phlegmonous processes are most common. The abscesses may be treated by warm fomentations, and they should be opened as soon as fluctuation is detected, especially when they occur in the scalp, as burrowing of the pus is often very extensive. Washing out the cavities of the abscesses with an antiseptic fluid serves a useful purpose. The phlegmonous processes may be combated by the usual local antiphlogistic remedies, such as cold compresses, or lead-water and laudanum. The system should be well supported at the same time. Phlegmonous erysipelas is a very dangerous complication. The ordinary variety of erysipelas is much more common and, of course, far less fatal. These affections are to be met by the usual remedies. Gangrene of the skin almost never occurs, except occasionally in the scrotum. This condition is extremely fatal. I have seen a few cases of gangrene of the scrotum, but never knew one to recover. The local use of antiseptic agents and a vigorously supporting internal treatment are perhaps the best that can be done for this complication. It is not advisable to attempt to remove the gangrenous parts until nature has effected their separation.

Corneal ulcer is not an uncommon complication. It often begins at the early part of this stage, sometimes a little later, and it may begin as late as the period of convalescence. The more destructive forms of this affection usually appear when the eruption commences to decline. The first evidence of a corneal ulcer is pain accompanied by slight redness in a certain part of the eye, usually at the margin of the cornea, and very soon an ulcer is formed. The ulcerative process is often very rapid—so rapid, indeed, as to destroy the entire cornea within forty-eight hours. At this stage of small-pox the eyes should be kept scrupulously clean, and as a precautionary measure a solution of boric acid (10 to 20 grains to rose-water 1 ounce) should be instilled in them once or twice daily. They should be examined frequently, and as soon as the ulcer appears I would recommend the use of the solid stick of nitrate of silver, which should be brought to a fine point and applied very delicately. Atropine in solution should then be instilled in the eye, and cold compresses applied. In spite of treatment, however, the ulcerative action often continues, destroying not only the cornea, but giving rise to iritis, perforation, and even sup-

puration of the globe. Anodynes may be required to quiet the pain, and the diet should be liberal.

The pleura and lungs occasionally suffer at this period of the disease. While an ordinary inflammation may occur in these parts, yet they seem peculiarly liable to a form of inflammation which, in the lungs, rapidly advances to purulent infiltration, and, in the pleura, to empyema. In treating these affections the fact must not be lost sight of that the patient is already greatly exhausted by the primary disease; hence the treatment should be principally of a supporting character.

Inflammation of the joints is by no means the rarest of the concomitant affections which may appear at this stage of small-pox. Like all other inflammatory processes in this disease, it strongly tends to suppurative action. Not infrequently, indeed, it seems to begin as a purulent synovitis. According to my experience, the elbow-joint suffers more frequently than any other. In the treatment of this affection no deviation is required from the ordinary surgical practice in such conditions in general. The pus should be evacuated and the parts treated antiseptically. Recovery from this complication is very rare indeed. When there is simply painful swelling of the joints, accompanied with slight inflammation and effusion of serum, good results may follow the use of ordinary local antiphlogistic remedies.

Septicæmia and pyæmia occasionally occur at the end of the suppurative period. When we consider the extent of cutaneous surface so freely bathed in pus and ichorous fluid at this time, it is, I think, surprising that this complication does not occur more frequently. The treatment here need not differ materially from that generally recommended for these affections occurring under other circumstances. As might be expected, the most approved treatment is not followed by very satisfactory results.

Changes in the abdominal viscera sometimes occur as complications. Of these, intestinal derangement is most frequent. This generally assumes the form of persistent diarrhœa. So common, indeed, is this disturbance of the intestines that Sydenham speaks of it as "*variola dysenterica.*" The ordinary remedies, such as opium, the astringent tinctures, and chalk mixture, will, in the majority of cases, succeed in quieting the bowels. Subnitrate of bismuth is also very efficient. Often, however, these remedies require to be given in full doses and frequently repeated.

Complications in the form of disease in some part of the nervous system are by no means rare at this stage of variola. We may also meet with suppurative otitis media, caries of the bones of the ear, ulceration of the mucous membrane of the nose, bronchitis, and various other affections. All these diseases should, of course, be met by the most approved medical and surgical treatment.

Convalescence.—The duration of the period of convalescence varies with the severity of the attack. In uncomplicated variola vera convalescence is usually completed in from four to six weeks from the earliest manifestation of the disease, making, therefore, the convalescent period itself of from two to four weeks' duration. When recovery takes place from the severer forms of small-pox, convalescence is not only slow, but is often interrupted by the occurrence of various sequelæ, among which furuncles and a succession of small abscesses are most common. Their treatment requires the application of hot fomentations until suppuration is established, and then the free use of the lancet. When these furuncular processes are very numerous and continue to be reproduced for a long time, good results may be obtained from the administration of Fowler's solution of arsenic. This constant recurrence of boils constitutes, according to some writers, the "furuncular diathesis," and indicates a depraved condition of the blood; more especially is this true when these suppurative processes assume the form of deep-seated abscesses. The occurrence of these sequelæ, therefore, calls for the use of tonics, such as quinine and iron; for stimulants, especially the malt liquors; and for a liberal and nutritious diet.

While erysipelas may occur in the preceding stage of the disease, it is much oftener met with during convalescence. It is generally not very fatal at this time, but yields quite readily to the ordinary treatment, such as the internal administration of 30 drops of tincture of chloride of iron every three hours, and external applications of diluted lead-water and laudanum. Other approved methods of treatment would doubtless prove equally successful.

Aphasia is sometimes seen as a sequela of small-pox. I have met with two or three such cases. This symptom evidently indicates that a certain part of the brain has sustained some damage from the variolous poison. It may be the result of a circumscribed encephalitis. According to my experience, recovery from this sequela is very slow; indeed, several months may elapse before the power of speech returns to anything like its normal condition. As to treatment, tonics are certainly indicated. For the purpose of aiding in the removal, by absorption, of any inflammatory products that may exist in the brain, iodide of potassium or iodide of sodium may be given.

Another sequela of nervous origin sometimes met with is paralysis. This symptom, I think, is more frequently seen in the extremities, especially the lower extremities. The source of this trouble is believed to be in the spinal cord. According to Curschmann, Westphal has shown that the paralysis is often due to numerous circumscribed foci of inflammation in the gray and white matter of the cord. The aim of the treatment should be to restore to a normal condition the diseased foci in the cord by favoring resolution of the inflammatory

changes. For this purpose ergotin, belladonna, or iodide of potassium may be given, while externally derivatives may be employed, such, for example, as painting the length of the spine with tincture of iodine, etc. When improvement begins it may be hastened by the use of the galvanic current.

The diseased area within the spinal cord may sometimes be favorably influenced through general stimulation of the tissue-changes by improved nutrition; hence any agent that tends to increase this function of the body is of service. We should therefore give tonics, such as iron, quinine, strychnine, and even cod-liver oil when indicated; we should direct the patient to bathe frequently, to live as much as possible in the open air—preferably in the air of mountains and woods; in short, we should direct him to make use of every possible means that will increase his appetite and strengthen his digestion, while at the same time he should be supplied with a liberal diet.

Œdema of the feet and legs is not infrequently seen after severe attacks of small-pox. In such cases there is always great exhaustion, and the patient is generally anæmic. The latter condition is doubtless the cause of the œdema in the great majority of cases. If there be chronic nephritis, the dropsy may be due to that disease; but nephritis is a rare sequela of small-pox. In the treatment of the anæmic cases, iron in some form should be administered, and a roller-bandage applied to the feet and legs. If the kidneys be diseased, of course they should receive appropriate treatment.

During convalescence from the severer forms of variola night-sweats are often profuse and exhausting. The mineral acids seem to be indicated for this condition, or belladonna or atropine may be given. The latter often proves very efficacious.

Decrustation, when slow in taking place, may be hastened by free inunctions of glycerin, cold cream, or petrolatum, and by the daily use of warm baths. After the scabs have fallen off, deep and unsightly scars remain in the cutis, but we are powerless to remedy that condition. But when, in addition to the scars, warty nodules remain on the face, their removal may be hastened by painting them once or twice a day with tincture of iodine.

When convalescence is not interrupted by the occurrence of sequelæ, no internal medicaments other than ordinary tonics are required. The patient's appetite is generally very good—often, indeed, voracious—and he rapidly regains both flesh and strength.

THE THERAPEUTICS OF VARICELLA, RUBEOLA, RUBELLA, AND SCARLATINA.

By J. P. CROZER GRIFFITH, M. D.

Possibly one of the most important matters to bear in mind in the treatment of the acute eruptive fevers of children is to avoid doing damage. The diseases are self-limited and children have vast recuperative power. If we let Nature alone, or stand by ready to assist, the great majority of cases will recover. On the other hand, the physician must be prepared to treat vigorously at times if life is to be saved. He is the wise man who knows when to stand aside and when not.

We can best consider briefly the general treatment of the four infectious diseases which form the subject of this chapter, as applicable to any one of them, and then take up more in detail for each the special treatment suitable to it.

Prophylaxis.

Hygiene of Sick-room.—Even in the case of the mildest of the eruptive fevers every effort should be made to prevent children contracting them. I have repeatedly known even an ordinarily mild attack of varicella turn the tide against a weakly infant, and precipitate a fading away which ended in death. No thinking physician will act on the principle, once much in vogue, that it is better for children to have the eruptive fevers and "be done with them." When, therefore, one child in a family has been attacked the attempt should be made to stop the spread of the affection to the others. This can be done with more or less success, depending upon circumstances and upon the nature of the infectious disease with which we are dealing.

The general prophylactic measures against the spread of the infectious fevers are as follows: Other things being equal, the room selected should be near the top of the house, as far from the apartments of other children as possible. There is a greater chance, too, that such a room will be more quiet. Unnecessary articles of furniture should be removed, especially upholstered goods, curtains, and the like; and it is better that the carpet be taken up, and small old

rugs or pieces of carpet laid about to prevent the room looking bare, and to make it more comfortable to the feet of the nurse. All clothing in chests of drawers and wardrobes should be removed. In choosing the room attention must be given to the feasibility of obtaining good ventilation. A room with a fireplace is the best possible for this. Where there is no such apartment available ventilation may often be obtained from a window distant from the bed, and so situated that there can be no draught. But, inasmuch as in the infectious diseases direct ventilation of this sort is difficult and often dangerous, arrangements should be made to obtain fresh air from an adjoining room. Indeed, when the setting apart of two communicating rooms is feasible the task of nursing is greatly lightened. The door opening from the entry into the sick-room should be closed and locked, and the space beneath it filled up by placing a rug against it. All entrance into the sick-room should be through the adjoining room, which we may call the "ante-room." The outer door of the ante-room—that into the entry—must be kept closed, and in the doorway should be suspended a disinfecting sheet. This must be kept constantly wet with a disinfectant solution, which may be either one of carbolic acid of 5 per cent. strength or one of corrosive sublimate in the proportion of 1 : 1000.

The windows of the ante-room should be kept open nearly constantly if the weather permits, and the door from this room into the sick-room closed, except when ventilation is desired. In this way the ante-room forms practically a part of outdoors, and completely shuts off the sick-room from the rest of the house.

In the ante-room should be a tub containing a 5 per cent. solution of carbolic acid. The addition of a little glycerin to the water makes the acid more easily dissolved. A good formula is the following: carbolic acid (Calvert's No. 4), 6½ ounces; glycerin, 4 fluidounces; water, 1 gallon. All the linen of the bed and of the patient and nurse should first be washed in plain water in the ante-room, and then allowed to soak for several hours in the tub. After this the articles may be wrung out and thrown into a bucket in the entry outside of the door, and then removed at once to the laundry, where they can be washed with boiling water without danger to the household. All dishes, spoons, forks, etc., should be washed in plain water and then soaked in the carbolic acid solution before they are taken from the ante-room. All feces, urine, and remnants of food should be placed in a disinfectant solution before they are taken away.

The nurse should take her meals in the sick-room or the ante-room. She should receive them at the sheeted door, and none of the domestics should enter the room. The nurse should, of course, use washable dresses and wear a cap larger than that commonly in

vogue, in order to protect her hair. When she is about to leave the child for the outing which she must necessarily have, she should remove her outer clothing in the ante-room, disinfect her hands and face with an antiseptic soap, put on her street-dress, and go directly out without stopping on the way to talk to any member of the family. She should sleep in the sick-room or, in some cases, in the ante-room.

It is better that the mother of the child separate herself entirely either from it or from the other children of the family. In case she is compelled to be at times with each, she should change her ordinary dress for one of washable material when with the patient, and before leaving the sick-room should take the same precautions for disinfection that have been recommended for the nurse. Neither should she go directly from the sick child to the well ones.

The physician in attendance should wear over his clothing while in the sick-room some such protective as the old-fashioned linen duster, or a rubber coat, or the like, as well as an oiled silk or similar cap. He should disinfect his face and hands before leaving the ante-room, and should not go directly from the house to those of other patients.

During the illness the room must be kept clean by the nurse. The floor and woodwork should be wiped with a damp cloth at frequent intervals ; but no sweeping can be allowed.

The period of isolation varies with the different diseases. When it is over, the child should receive a disinfecting bath. It is first scrubbed thoroughly, including the scalp, with soap and water, and then washed with a 2 per cent. solution of carbolic acid, or a 1 : 5000 solution of bichloride of mercury. The child being then removed and dressed in clean clothes, both the rooms must be disinfected. The floors should be washed with one of the stronger disinfectant solutions, and the walls and ceilings also if they are painted. Papered walls should later be repapered. All the furniture and the bedstead should also be thoroughly disinfected, remembering that solutions of mercury cannot be used on metal. All articles which can be spared should be burned. In cities which possess a disinfecting plant for the purpose the pillows and mattresses should be subjected to steam under pressure. Where this cannot be done these articles should be opened to enable disinfecting vapor to penetrate them better, and should then be left in the rooms while these are thoroughly fumigated. In the process of fumigation the cracks of the windows and doors, and the keyholes, should first be stopped with cotton or paper. Then formalin vapor should be liberated, either from the larger, more elaborate apparatus or from one of the simple and inexpensive formalin lamps which are on the market. After about twelve hours the rooms may be entered and the windows raised and kept open until

the vapor, which is very irritating to the eyes, has been dissipated. In place of formalin, the vapor of burning sulphur may be used; although to make it at all effective water should be boiled in the room at the same time. The sulphur candles to be had at drug-stores are very convenient. Instead of these, broken roll sulphur, in the proportion of 3 pounds for every 1000 cubic feet of air-space, may be moistened with alcohol, placed in a pan, and burned. Precautions must be taken against fire, by placing the pan of sulphur in a dish half-filled with earth, or upon bricks standing in water. It should be remembered that the vapor of burning sulphur, especially in combination with water vapor, is a powerful bleaching-agent of many colors.

Such is the method of quarantine treatment of the infectious diseases in detail. Troublesome though it is, it should be carried out in full to insure success. It should certainly be employed in cases of scarlet fever. In measles it is not so commonly applied, partly because both the profession and the laity are prone to look upon an attack of measles as a matter of little consequence—a most pernicious view—partly because the poison of this disease is much more evanescent and not easily carried from the sick to the well, and partly because the disease is so intensely infectious by direct contact at the beginning of the attack, and even before the initial symptoms appear, that the stopping of its spread generally fails utterly. Nevertheless, since it is sometimes possible to prevent it attacking other members of the family, the effort should always be made to accomplish this. Isolation in this disease is, however, far more important than disinfection.

In rubella the same likelihood of early infection exists, making the spread of the disease almost uncontrollable. Moreover, since the affection is nearly always a mild one, such rigorous quarantine measures are hardly necessary. The same is true of varicella. Always, however, I believe that at least isolation should be practised, since both rubella and varicella may at times be severe.

Treatment.

In the general management of the eruptive fevers it is all-important to attend to the hygiene of the patient. The selection and ventilation of the sick-room have already been described. The temperature of the room should be maintained at 70° F. both night and day. Allowing the heat to diminish at night is dangerous.

There is a great tendency among the laity to cover sick children far too warmly with bed-clothes. This matter must be carefully watched by the attending physician, for the sake of the comfort of the children, who are either too young or too ill to complain of it themselves. No more covering is needed than is comfortable. There

is a popular fear of changing the bed-clothes or the body-linen during an eruptive disease. It is needless to say that this is all wrong; yet the physician must be on the watch against the error on the part of the family or the nurse. The change should be made frequently, taking care merely that the fresh clothing has been aired and slightly warmed before it is used. A fresh sheet on the bed is often a source of great comfort to a restless child, and gets rid of all the "crumbs" which are so annoying.

Ablution of the patient for the sake of cleanliness and comfort should be done daily as in any other disease. There is a widespread dread of water in the eruptive fevers which has no foundation in common sense. Water possesses no dangers if properly employed, and is often very refreshing.

As regards diet, if the state of the digestion is good, one absolutely of milk is not a necessity for older children, although it is, on the whole, the most satisfactory, and should be the sole diet in cases of high temperature or with certain complications. If porridges are used, care should be taken that they are not of a nature that may irritate the intestine and produce diarrhœa; as, for instance, porridges of oatmeal or of ground whole grain will sometimes do. Milk may be cold or hot according to taste. When there is but little appetite and the children are unwilling to take food, it is not well to urge them during the earlier days of the attack. Later, if there is an aversion to milk, it may sometimes be made more palatable by flavoring it slightly, as with vanilla extract. Ice-cream is often a tempting and generally a harmless food if given in moderation. Abundance of drinking-water should be allowed, and even urged. It assuages the thirst, which is often severe, and is an excellent diuretic as well. The water may be cool, but not iced. Sometimes it may be acidulated or carbonated with advantage in the case of older children. Sometimes, but not often, it is necessary to guard against excessive drinking of milk by offering water to quench the thirst.

Further treatment is symptomatic. The fever, if slight, may be combatted by such mild diuretics and diaphoretics as citrate of potassium, spirits of nitrous ether, and the like, to which can often be added with advantage small doses of tincture of aconite root. When, however, fever is high more powerful measures are sometimes required. It is most important to remember that the employment of these should be determined more by the concomitant symptoms than by the mere fact that a temperature of 104° or 105° F. is present. When the fever is accompanied by great restlessness, delirium, stupor, sleeplessness, gritting of the teeth, or other evidence of a much disturbed nervous system, strong antipyretic measures are indicated.

In the first rank here is hydrotherapy, and especially, in my experience, the use of the tepid or warm bath. Generally a decided lessening of the temperature and a relief of the nervous symptoms can be obtained by this means. This form of treatment has been popular for years, before the use of cold water was so much in vogue, and experience has given me no reason to abandon it. The warm bath, and sometimes the hot mustard-bath, should always be the means employed when with high temperature there is feeble cardiac action. In some cases better results are obtained by means of cold sponging or the cold pack, applied exactly as in non-eruptive febrile diseases. In cases in which these measures fail the cool—or even the cold—tub bath may be used; and in those instances in which there are very severe cerebral symptoms with hyperpyrexia this treatment should be the first employed. Life may be saved in this way. Yet an extended experience has convinced me that patients during infancy and early childhood do not, as a rule, bear the cool bath as well as do adults, and that a bath of 85° or 90° F. at this age will generally accomplish as much as one of 70° F. in later life. Even the tepid baths of 85° F. are not infrequently attended by a too great diminution in the force of the pulse, and must be abandoned. This applies perhaps particularly to the longer continued pyrexia of typhoid fever as seen in children. Yet even in the eruptive fevers of shorter duration the tepid and cool baths, although most valuable agents, must be used with careful watching of the general effect. The reduction in bodily temperature is not desirable unless it is attended by improvement in the general condition.

Where warm bathing fails and cool bathing is not well borne, the antipyretic drugs of the coal-tar series are most valuable. In my experience they are peculiarly well tolerated by children, and, given properly in the eruptive fevers, I have never seen them do anything but good. Not only do they lower temperature, but they exert also a distinct, separate action upon the nervous system, removing the alarming symptoms in a very satisfactory manner. Acetanilid is too powerful; antipyrin and phenacetin are better. The dose can be determined only by watching the effect. For a child of two years 1 grain of antipyrin may be the initial dose, and this amount increased if no results are obtained. I have repeatedly seen delirium, stupor, rolling of the eyes, gritting of the teeth, and similar evidences of a disturbed nervous system promptly disappear after the use of these antipyretics, even when the fever was but slightly reduced. Sufficient of the drug to produce great fall of temperature, profuse sweating, or coldness of the skin, forms too large a dose. Yet although these antipyretics do act so favorably, I consider hydrotherapy much to be preferred in the average case.

Alcoholic stimulants are not, as a rule, required in the average cases of any of the four eruptive fevers which we are considering. This is also true of cardiac tonics. When to use them, as well as other matters in the line of treatment, can be better discussed under the headings of the different diseases.

Varicella.

Isolation should continue until the crusts have fallen off; a period lasting commonly two to three weeks, or even longer. The diet should be light at first, as it is possible in occasional cases for nephritis to develop. For the same reason chilling must be guarded against. If there is much fever, the child should be confined to bed and a febrifuge given. But the attack is generally so light that no medication is required, and even confinement to bed is not a necessity.

Precautions must be taken against the scratching of the vesicles by the child, or the irritation of them by the clothing, in order to prevent scarring as far as possible. The skin must be kept clean, and any especially large vesicles which have undergone suppuration should have the purulent crusts removed and be dressed with an antiseptic ointment.

Rubeola.

Although it is very possible that the desquamating scales of measles are not infectious, as once supposed, yet, since this is still uncertain, isolation should continue until all scaling is more than well over—*i. e.*, until two or even three weeks have elapsed from the beginning of the attack. Every child with measles should be confined to bed for at least ten days from the onset of the attack. Even where isolation is not required, as where there are no other children, the patient should be confined to the room for two weeks, to avoid the great danger of taking cold. The diet should be liquid at first; and even later, until convalescence is established, it must be selected with care in view of the tendency to the development of diarrhœa.

Many cases require only the general mild medicinal treatment already outlined. The majority, however, have certain symptoms which demand special attention. The temperature of measles quite usually rises to 104° or 105° F. on the second or third day of the eruption. This demands nothing more than the simple febrifuge already described, unless the attending symptoms are annoying or threatening. Quite usually, too, there is a decided degree of mental dulness attending, which need cause no alarm unless excessive; but where the high fever is accompanied by unusual symptoms antipyretic treatment must be instituted, as already detailed.

The irritation of the eyes so commonly present requires protec-

tion from light. It is generally not necessary to have the room entirely dark. The partial closing of the shutters, or the use of a large screen, may be sufficient, thus permitting a convalescent child to amuse itself with toys. Precaution must be taken, however, against letting a child use its eyes too soon for reading or other fine work. A boric acid collyrium is often a great relief during the height of the disease. Anointing the edges of the lids with vaseline will prevent their adhering.

The marked catarrhal symptoms also need treatment. Cough is often most harassing and requires opiates. Frequently the addition, too, of a bromide salt, ipecacuanha, or antipyrin aids in controlling the cough. As the disease advances, or as it is declining, there is often a very decided bronchitis with abundant secretion. This may be treated by the administration of a stimulating expectorant, such as chloride of ammonium or squills. Should the cough prove very persistent, iodide of ammonium, terebene, or tar may be of service.

The annoying coryza may well be treated in many cases by spraying the nose with weak alkaline antiseptic solutions; or an oily solution of menthol in liquid cosmoline (gr. iij to the ounce) may be employed. In the case of children who resist spraying a small portion of an ointment of menthol in unguentum petrolati may be applied in the nostrils with a camel's-hair brush.

Vomiting is seldom a troublesome symptom. It is best treated by changing the diet or stopping all food for a short time. The condition of the bowels, however, needs attention. Although relief of constipation is sometimes required, this must be done with caution, and best by enemata, on account of the tendency patients with measles have to the development of diarrhœa. This symptom, if at all severe, must be treated promptly, as it is sometimes very debilitating. I have known it to be the direct cause of death in weakly children suffering from measles. Mixtures of bismuth, chalk, and opium are generally successful. Sometimes salol or astringents may be advantageously employed.

Itching of the skin is sometimes very troublesome. The use of weak washes of carbolic acid, or of weak carbolized oil, is generally satisfactory, or a dusting-powder of camphor, zinc oxide, and starch may be used. In some cases of measles considerable laryngeal stenosis develops. For this the inhalation of water vapor under a croup tent should be administered, with the giving internally of ipecacuanha, the bromides, and opium. It is important to remember that this symptom is frequently an evidence of a complicating diphtheria, which needs promptly the treatment proper for this disease.

Cases of malignant measles demand strongly stimulating treatment with alcohol and cardiac tonics, combined with hot mustard-

baths, perhaps also with ice to the head if the temperature is high. Stimulating treatment is also required in those cases of the disease in which a typhoid state tends to develop.

One of the greatest dangers of measles is the development of pneumonia, especially of the catarrhal form. Great caution in the matter of exposure to cold tends to prevent the occurrence. One must be constantly on the watch for the first symptoms and begin promptly the treatment best suited for it, which does not differ from that of bronchopneumonia due to other causes. The various other complications need not receive special attention here.

During convalescence precautions must be taken against the development of tuberculosis, which is especially prone to occur as a sequel. The general health of the child must be improved in every way by tonics, especially cod-liver oil, and continual watch kept against taking cold. Change of air is often very beneficial.

Rubella.

Isolation in this affection should be continued for three weeks from the onset, if we wish to insure against its spread. The disease, however, is almost always so mild that few are willing to take such precautions. Yet, since it may, although rarely, be severe, and complications may arise, isolation should be practised. I have seen pneumonia develop in several instances. The patient should be confined to bed at least until the rash has disappeared, and should be guarded against exposure to draughts and chilling. Darkening of the room is required in some instances, namely, in cases of the morbilliform type. A febrifuge is of advantage. The catarrhal symptoms are generally slight. When present they may be treated as in measles. The throat is often quite sore, but the inflammation is of a superficial character, and seldom needs other treatment than the use of an alkaline spray or an astringent gargle.

Scarlatina.

Isolation in this disease must be carried out with the greatest possible care for all details, and throughout the whole attack, since the desquamating scales are very infectious. Children who have not been exposed should be sent away from the house. Even if they have been exposed, removal is often advisable, especially if a week has passed and no evidence of the disease has appeared. How long the isolation of the sick child shall continue varies with the case. As a rule, five or six weeks from the onset of the fever are required. Certainly isolation must continue until all traces of peeling have ceased. In some very mild cases, with peeling absent or slight, it may be possible to curtail the quarantine, but in others the duration

must be even longer than that given, owing to the tendency often seen for desquamation to persist and even to repeat itself several times. Confinement to bed should continue during all the febrile period, and, better, for a week longer. As the skin is often very susceptible to cold, it is even better in winter-time to confine the child to bed until desquamation is over. After leaving the bed the child should be kept carefully away from the windows, and be guarded from all draughts; for although it is with reason believed that the development of most of the complications depends upon the specific germ, yet it is certain that chilling of the body may act as a powerful accessory cause. In fact, I do not know of any condition in which I have seen complications develop more readily and quickly after slight exposure to surface chill.

The diet should be liquid, in view of the irritation of the kidneys which so constantly attends the disease. Even after pyrexia has disappeared the diet should still be liquid or semiliquid for a week or two.

After the careful daily sponging with warm water the skin should be anointed with carbolized oil, 5 per cent. This tends both to stop the itching, which is sometimes annoying, and to disinfect the scales and thus check the spread of the disease.

The mildest cases of scarlet fever require very little treatment of any sort. However, the peculiar tendency in this disease to involvement of the throat quite often necessitates some therapeutic measures directed toward this. When the involvement is not great, alkaline antiseptic sprays to the throat and nose are all that is needed, or the use of an astringent gargle. If there is great resistance on the part of the child to treatment of this kind, it may be better to omit it altogether, and to allow the patient simply to suck ice frequently. Yet, inasmuch as the affection of the throat is liable to be followed by otitis, the mild treatment described should be carried out whenever possible.

When the tonsillar inflammation is more severe the application of ice-bags is often of great benefit. The bags should be of thin rubber (or a bladder may be used), and one should be applied upon each side of the neck, and held in place by a bandage going *over* the head. It is often well to place a layer of towel between the bag and the skin, to prevent too vigorous action of the cold. The long, narrow, and thicker rubber ice-bags often sold are of little service, as it is impossible to adapt them well to the parts. When using ice-bags it is very important to take precautions against the wetting of the pillows and the clothing about the neck.

Not infrequently extensive membrane forms on the tonsils and even beyond them, and there is blocking of and discharge from the

nose. Such cases simulate diphtheria, and indeed in many instances are a combination of diphtheria with scarlet fever. A bacteriological study should be made at once if possible, and the proper treatment for diphtheria employed if the Klebs-Loeffler bacilli have been found. If one is in doubt about the diagnosis, it is safer to treat the case for diphtheria. In many cases the nasopharyngeal inflammation is streptococcic only. As this often may become a serious complication, it demands active treatment. The nose should be sprayed frequently with diluted peroxide of hydrogen, and the throat also cleansed by swabbing with it in greater strength. An application may then be made directly to the tonsils either of tincture of the chloride of iron with glycerin (1 : 4) or of a solution of nitrate of silver (20 grains to the ounce). Numerous other substances for local treatment have been recommended and found useful, such as a solution of chlorinated soda, one of permanganate of potassium, and saturated solutions of boric acid in water or in glycerin. Inasmuch as such local treatment often causes intense opposition on the part of the child, the physician must determine in every case whether the good obtained will offset the exhaustion from the struggle. These anginose cases of scarlet fever frequently exhibit considerable debility, and require alcoholic stimulants in moderate, and sometimes in large, amount. Cardiac tonics, too, are often needed.

Malignant scarlet fever is so extremely fatal that treatment has but little influence upon it. In any event it can be but symptomatic. Hot mustard-baths may be given in the hope of stimulating the heart's action, relieving the nervous symptoms, and reducing the temperature, which is often high. In other cases cold bathing is better, but with due regard to the strength of the pulse. Alcohol and digitalis must be used freely. Bromides and chloral may be required if convulsions are present.

Vomiting is liable to occur at the beginning of every attack of scarlet fever, and sometimes later; but it is rarely troublesome. Abstinence from food and the administration of cracked ice are generally sufficient to combat it.

Diarrhœa is not often troublesome. If moderate, it may be disregarded; if severe enough to produce exhaustion, it must be treated energetically with bismuth, astringents, and generally opiates.

Otitis is a very common complication. It is questionable whether the local treatment described for the throat and nose is often successful in preventing its occurrence, but at least the attempt to prevent should be made. It should certainly be insisted on if otitis has actually commenced. In addition to this, the application of dry heat, the wearing of a flannel cap, and the injection of hot water into the external auditory canal are all useful measures for the relief

of pain and the subduing of inflammation. Belladonna, the bromides, and opium should be administered internally. Generally, however, suppuration takes place, and the membrane perforates. Should pain be intense and the membrane be found bulging, paracentesis may be performed, and several days' suffering saved. The treatment after perforation has occurred is that of otitis from other causes than scarlet fever. Inasmuch as mastoid disease, purulent meningitis, permanent deafness, and other sequels not infrequently follow otitis in scarlet fever, the physician must watch carefully for involvement of the ear in the course of the disease, and apply treatment promptly. The advice of an aural surgeon should be had, when possible, in all cases with threatening symptoms.

Cervical adenitis likewise is a common complication. More or less involvement of the glands is nearly always present. When this is considerable the application of ice-bags is often very serviceable. In some cases hot poultices afford greater relief to the pain. These must be used with caution, and not for too long a time, lest they increase the tendency to suppuration. If suppuration takes place, early incision is advisable. If the glands show little tendency to change, ointments of ichthyol or of mercury may be beneficial in promoting absorption.

By far the most dreaded complication of scarlet fever is nephritis. This occurs oftenest during convalescence, and in cases which have been mild. In every case of scarlet fever the urine should be examined at very frequent intervals in order to detect albuminuria early. The occurrence in the urine in the course of the disease of a certain amount of albumin, and even of a few casts, yet without clinical symptoms, is quite common and is not an unfavorable indication. It is, however, a warning to observe still greater watchfulness, to reduce the diet absolutely to milk if it has been other than this, to keep the bowels open and the child warm, to give plenty of water to drink, and to administer some mild diuretic, such as citrate of potassium.

When there are distinct clinical symptoms more energetic measures are required, their nature depending on the severity of the attack. The symptoms oftenest present are a certain amount of œdema of the face and feet, and often of the hands; scanty secretion of urine, which is smoky or muddy in appearance; fever, fretfulness, and possibly vomiting. A more powerful diuretic should be given. My own preference is for acetate of potassium with infusion of digitalis. Stimulating diuretics which irritate the kidneys are to be avoided. The wearing over the kidneys of hot poultices, which are renewed every two hours or oftener, seems often to be of benefit. Baths of 95° to 100° F. given daily are of service. A moderately free action

of the bowels, produced by mild laxatives, is also a help. In more severe cases, in which the urine is nearly suppressed, and in which there is a stuporous state or possibly convulsions, we are dealing with distinct uræmia, and must act accordingly. The steam- or hot-air bath is here to be preferred, perhaps combined with the administration of small doses of pilocarpine, remembering, however, that this drug is depressing to children, and that stimulants may be required as well. Free purgation is needed. Bromides and chloral by the bowel, or morphine hypodermically, should be given if convulsions are present. In urgent cases even venesection may be employed.

After the acute stage of the nephritis is over a certain degree of anæmia is apt to remain, and some œdema may persist. Such a diuretic as Basham's mixture is now very useful. Great care must be taken with the hygiene and diet for weeks after convalescence seems established, and frequent examinations of the urine should be made. If the nephritis becomes subacute, Basham's mixture should be persisted with, and the child sent to a warmer climate, and every precaution taken against chilling of the skin. Other complications of scarlet fever are so unusual, that their therapeutics do not require special consideration here.

YELLOW FEVER.

By D. T. LAINÉ, M. D.

GENERAL CONSIDERATIONS.

The literature of yellow fever is voluminous, and it is not within the province of this article to discuss even a tithe of what has been written of the disease nor pass upon the relative merits of this or that theory. But it would be well, before taking up the subject of its treatment, to review in a cursory manner some facts about its symptomatology and diagnosis upon which there is more or less unanimity of opinion in the medical profession. Many things, it is true, are merely current beliefs, but others stand on such good evidence and have been reached by men of such wide experience under so varied conditions of observation that they must be accepted as being correct.

A more scientific knowledge of other diseases has also tended to clear up many of the obscure points about yellow fever, although it is regretable to be obliged to confess that (the most important point of all) the nature of its morbific agent still remains a mystery.

A review of its literature, or even an exchange of opinions with men of large experience and practice in localities where it is endemic, may at first convey the impression that there is little about yellow fever upon which the profession is agreed, but if a more careful analysis of the facts is made it is evident that there is no marked difference of opinion on the vital points; the differences are only superficial, the underlying facts being the same.

For example, one set of physicians insist that mercurials are the only purgative to be used; another pin their faith upon large doses of castor oil, and claim that it will save more lives than any one drug; another cannot successfully treat the disease without the preliminary emetic, and so on *ad infinitum*. One physician will insist that some special mineral water must be given to every patient suffering from yellow fever; others, that a tisane of watermelon seeds is almost a specific, etc.

The apparent diversity of opinion should not mislead us; individual preference for this or that drug cannot affect the fundamental law of its therapeutics, on which the profession stands as a unit, *i. e.*,

that yellow fever patients must be kept in bed, purged, dieted, and the eliminative organs stimulated.

Yellow fever, or el vomito negro, is a specific, infectious disease endemic in certain tropical cities of the Atlantic seaboard, whence it is carried by commercial or human intercourse to other populous centres, where it becomes epidemic if certain prerequisites for its development are present. The most favorable conditions, although there may be others unknown to us, are, first, a degree of atmospheric heat ranging between 70° and 90° F., maintained for some time; and, secondly, the presence of non-immune individuals. The other factors which no doubt play an important *rôle*, but which are not necessarily essential, are filth, unsanitary surroundings, overcrowding, excess of atmospheric moisture, and proximity to the sea or its level.

When the infectious agent is introduced through fomites or an infected individual, the two known methods of transmission in a locality previously free from the disease, its propagation and difficulty of control will largely depend upon the unsanitary conditions present; but this, *per se*, does not constitute an essential factor, since yellow fever may effect a lodgement and become epidemic in a clean city.

In regard to its etiology, it is now universally admitted that the specific virus is caused by the presence of a living organism in the body, and in the present state of science the truth of this hypothesis may be assumed to be correct. Sanarelli's claim to the discovery of the specific organism has attracted the widest attention, but "the bacillus icteroides" is far from being universally accepted as the true germ of yellow fever. Sternberg has recently expressed himself on this point as follows: "The bacillus of Sanarelli is a pathogenic saprophyte which is present occasionally and accidentally in the blood and tissues of yellow fever patients, and that its etiological relation to this disease has not been established." Reed and Carroll, U. S. A., who have carefully studied this organism in the laboratories of the Army Medical Museum, are also opposed to the views expressed by Sanarelli, and believe that the "bacillus icteroides" should be classified in the same group as those of hog cholera. On the other hand, Wasdin and Geddings, of the Marine-Hospital Service, have arrived at the opinion, as a result of their investigation, among other conclusions, "That the micro-organism discovered by Prof. Guiseppi Sanarelli, of the University of Bologna, Italy, and by him named bacillus icteroides, is the cause of yellow fever." As the matter stands, we must await the results of further investigation.

For the sake of convenience, yellow fever may be divided into three forms: the mild, the typical, and the malignant; but it is

always the same disease, a more or less virulent toxin acting on an organism with greater or less resisting power. Age, race, temperament, previous state of health and mode of living, lesions of the stomach, liver, and kidneys, all play an important *rôle* in its symptomatology, prognosis, and treatment. It is a specific fever characterized by an initial paroxysm lasting from two to four days, followed by a period of calm, which either marks the beginning of convalescence or is quickly followed by a secondary rise in the temperature, during which there are great depression of the vital forces, a tendency to suppression of the urine, and hemorrhages from the mucous surfaces, terminating in complete recovery or death.

As is common in all specific fevers, we may have a variety in its initial symptoms; but a typical case cannot be mistaken, after the lapse of one or two days, for any other disease, if it occurs in a non-immune person during the prevalence of an epidemic or in one living in a locality where the disease is endemic. A sudden attack of fever with or without chill, preceded or not by premonitory symptoms, severe frontal headache, pains through the loins and muscles of the thighs and legs, face flushed, conjunctivæ injected, eyes shining and watery, temperature ranging between 102° and 104° F., with a distinct (relative, not absolute) remission between the second and fourth days; pulse at first between 90 and 120, full and strong; but *progressively decreasing* both in force and frequency, irrespective of variations in temperature, and eventually becoming extremely slow, soft, compressible, or even gaseous. The mind is clear, and in nervous patients great restlessness is present. The gums are red, becoming in time swollen and spongy; the tongue not heavily coated, as is common in malaria, but eventually pointed and red at the edges. There is nausea and vomiting of an acid mucus tinged with bile; complete anorexia, epigastric distress, and constipation; a rapid tendency to stasis in the superficial capillaries; slight icteric discoloration of the conjunctivæ and skin, and the presence of *albumin in the urine on the second or third day of the disease.*

The remission of the fever on the second, third, or fourth day ("period of calm") is followed in a few hours by a secondary rise, with more serious symptoms and complications. The pulse progressively decreases in the number of its beats and loses in power and volume; the skin and sclera assume a more pronounced yellowish tinge; there is bleeding from the swollen gums. Epistaxis, or hemorrhages from other mucous membranes, now makes its appearance, frequently accompanied by ecchymotic patches or a general erythema of the surface. The vomiting now is of an intensely acid mucus, which soon becomes streaked with blood in minute flocculi—"pattes de mouch," a condition which usually precedes the typical

"coffee-ground" or black vomit. The urine becomes darker from concentration or the presence of bile-pigments, and on boiling becomes semi-solid from the large quantity of albumin present. Then there is either an amelioration of all the symptoms, followed by complete recovery (marvellous in its rapidity); or the symptoms progressively increase in severity, delirium, coma, and complete suppression of urine supervene, and death ensues from uræmia, hemorrhages, or cardiac failure. This typical clinical picture renders the disease unmistakable, but unfortunately such well-defined forms are not always met with.

The mild, abortive, and even non-albuminuric types (for there is evidence accumulating to prove the existence of such cases) are not only difficult, but frequently impossible to diagnose. Yellow fever has no pathognomonic symptoms; it is only recognized by a group of these, and by the order and sequence in which they appear.

Unless a widespread epidemic exists, the diagnosis is never positively made before the second or fourth day from the initial chill, and in many cases not at all. The writer has recently seen a patient in whom the diagnosis could not be confirmed until another occupant of the same room developed a typical attack of the disease about the same time. The fever in the suspected case was moderate, but there was never a trace of albumin in the urine, and the icterus only appeared after the patient was convalescent.

In an infected city like Havana, where sporadic cases are continually occurring, the difficulty of an early diagnosis becomes apparent when the attempt is made, as during the past year, to have all cases promptly reported. Many of the reported cases proved to be other diseases, and frequently the death certificate came at the same time as the report; not because of a disinclination on the part of the physicians to report the cases, as much as from their inability to make a prompt diagnosis. Of the 370 reported cases in Havana during the year 1899, only 280 proved to be yellow fever; the mortality was 34 per cent.

Taking such facts as the foregoing under consideration, it would appear that the discovery of a method which would insure an early and positive proof of the existence of the disease would be more valuable than one which would reduce its mortality, especially in countries like the United States, where yellow fever is not endemic. The experience of recent years has repeatedly demonstrated the feasibility of stamping out epidemics in their incipiency; and it is well known that it is the mild, and not the severe, forms which commonly originate them. These mild cases not only transmit infection as effectually as the more severe types, but from the fact of their mildness they often pass unnoticed. It is not uncommon in the Southern

States for hundreds of cases of yellow fever to be treated for malaria, dengue, or ephemeral fevers, until the sudden appearance of hemorrhage with albuminuria in a patient draws the attention of the physician to the true nature of the malady. Yellow fever is then recognized, but unfortunately the problem is no longer the same; the epidemic has become so extensive that isolation, depopulation, and quarantine are usually ineffectual until the advent of cold weather. At other times these same mild cases are promptly recognized, but physicians and boards of health are powerless to convince communities of the presence of yellow fever, not being able to give positive proof that such cases are really the milder types of the disease. Many physicians through ignorance or otherwise will not admit the existence of such a type.

Some men, whose opinions carry great weight, have been rather too sanguine in expressing themselves as to the ease of diagnosing this disease. A well-known authority says: "The diagnosis of individual cases of yellow fever is, in my opinion, very easy. There is no acute febrile disease in which there are as many signs that may be called pathognomonic; the diagnosis of the disease rests upon three such symptoms, namely, the facies, the albuminuria, and the want of correlation between pulse and temperature. I rely mainly for my diagnosis upon the facies, which I consider extremely characteristic." On the other hand, many medical men of wide experience claim that there is not one symptom or group of symptoms present in yellow fever which are not also common to many febrile conditions. The cephalalgia, rachialgia, congestion of the conjunctivæ, flushed face, and even albuminuria are not uncommon in the malarias of the tropics and in other diseases.

Repeated mistakes in diagnoses occurred in this city during the past year, in the practice of very competent men, when malaria, smallpox, and other diseases were treated as yellow fever for days, and *vice versâ*, and this in a locality where yellow fever is present all the year round.

As is now well recognized, the presence of the plasmodium in the blood does not exclude yellow fever; nor does its absence signify that the patient has not malaria, for we are all aware of the difficulty of finding in the peripheral circulation in æstivo-autumnal fevers the organism of Laveran; in the tropics it is also not uncommon to find the two diseases coexistent, yellow fever, so to speak, bringing out the latent forms of paludism.

The same difficulty is found in respect to the pulse; several authors recognize the fact that a slow and falling pulse is also found in dengue, or when jaundice appears in other diseases. This same

characteristic of the pulse will be noticed in acute fevers when the patient is submitted to an absolute (starvation) diet, or when there is a sudden cutting off of tobacco in inveterate smokers.

It is evident that the diagnosis of the disease is not always possible, and is never positive in the mild types, the very cases in which it is most important this should be done, since they transmit the infection as effectually as the severer forms.

TREATMENT.

It may be briefly stated that of the different forms of yellow fever there is only one in which intelligent treatment may produce some benefit, and this must begin as soon as the disease has developed. Those unrecognized or neglected cases in which the treatment has commenced after black vomit has supervened and the albuminuria is pronounced, or the patient is already in a typhoid condition, usually die in spite of all that can be done. The same is true in the pernicious or siderant type; the virulence of the toxin is so great in these cases that the patient succumbs on the second or third day; fortunately they are rare. The light cases all recover.

There is no "cure," or specific, for yellow fever; it is a self-limited disease, the life or death of the patient depending upon the virulence of the poison and the resistance his organism can offer against its invasion. Therefore it reduces itself to one of expectancy and the treatment of symptoms as they arise. There are certain requisites, though, which are common to all forms of the disease, and these briefly stated are the preliminary purgative, absolute rest, good nursing, the withholding of food for several days, and the administration of water freely throughout the course of the malady. This constitutes the only rational treatment of yellow fever, the one universally accepted by the profession; the foundation, so to speak, upon which many details are laid.

Another point about yellow fever on which stress should be laid is that every suspicious case must be treated "as if there were no doubt of the diagnosis," as aptly expressed by Touatré; and as the success of treatment largely depends upon the promptness with which it is applied, it may truly be said that in localities where the disease is endemic, as in Havana, this must be carried out in a large proportion of the cases long before the diagnosis is confirmed. Fortunately the indications are so simple that the patient suffers no harm if our suspicions prove untrue.

When called to the bedside of a patient during the prevalence of

an epidemic, or to a stranger living in a locality where yellow fever is endemic, the history of the case must be carefully taken and a complete clinical record kept at each subsequent visit. The diagnosis, prognosis, and treatment largely depend upon the thoroughness with which this detail has been carried out. A note-book or clinical chart is indispensable, on which must be recorded the personal and previous history of the patient, the history of the present illness, and all the symptoms observed during the evolution of the disease; those specially to be looked for being the appearance of the eyes, face, gums, skin, and vaso-motor disturbances; the degree of fever, character and frequency of the pulse, condition of the stomach and bowels, the presence or absence of epigastric distress, muscular pains, their location, the amount of urine and the results of its analyses.

As good nursing is indispensable, one of the first vexing questions which will present itself will be the availability of a reliable attendant. The most desirable person is the modern trained graduated nurse; but if one is not to be had, it is preferable to intrust the care of the patient to an intelligent friend or member of the family, who will have no preconceived notions as to how the case should be managed, and will be more likely to carry out implicitly and faithfully the instructions of the physician.

Another point that will frequently arise and must be quickly decided by the physician is whether, on account of the lack of nursing or other reasons, the patient will have to be transferred to a hospital or to different quarters. If this becomes necessary, it is preferable that it be done as early as possible in the course of the disease—certainly before the period of defervescence, when the excitement and exhaustion consequent upon moving may be sufficient to turn the scale and indirectly bring about a fatal termination. If the transference of a case becomes imperative, this should be done under the direct supervision of the physician; the patient must under no circumstances be permitted to walk or in any way exert himself, but must be carried on a stretcher from his bed to the hospital.

Having decided to treat the case at home, the next requisite is the choice of a proper room or apartment; this should be large, bright, cheerful, and well ventilated, and, if possible, in the second story (as the yellow fever germ lurks and spreads near the ground), and such quarters should be situated beyond the infected area. Abundance of fresh air and sunlight are important requirements; their absence not only intensifies the virulence of the poison in an already developed case, but the infection of the premises or rooms is certain to take place. One reason for the high death-rate in New Orleans and throughout the South during the days of the old-fashioned creole nurse, was the invariable custom of treating yellow fever cases in

dark, unventilated rooms, the fear of the patient "taking cold" being uppermost in their minds. Their treatment consisted in immediately placing the patient in bed, giving a very hot mustard foot-bath, a large dose of castor oil, and no food of any kind until, as they termed it, "the fever broke," which was expected about the third or fourth day. They covered the patient with many layers of blankets or quilts, and closed all the openings in the room to prevent the entrance of a draught, as the patient "might take cold." As many of the houses were without glass windows, the closing of the wooden blinds excluded both air and sunshine, thus producing two very favorable conditions for the growth of the yellow fever germ. The underwear worn by the patient at the time of the attack and the bed-linen were never changed, but continued in use until recovery or death. During the years of yellow fever when this type of nurse cared for the patient there was always a rapid spread of the fever, a large number of cases, and an enormous death-rate.

Patients should invariably be removed and not treated in previously known infected localities, for it is more than probable that a secondary auto-infection takes place under such conditions, or an intensification of the toxin. This is the only rational explanation of the high death-rate in certain old buildings or cities like Havana, where from the peculiar construction of its houses and their previous infection the mortality still remains high—34 per cent.

The old Spanish Military Hospital in Havana had so notorious a reputation as a focus of infection that twice in its history it was closed on this account; in one ward, the 5th especially, nearly every non-immune admitted not only developed the disease, but invariably there was a fatal termination, even when the mortality in other parts of the city was not so high. Nor is it to be wondered at that the disease remains endemic in this city and the outlook for its complete eradication seems well-nigh hopeless, when we consider the architecture of its houses. These are quadrangular buildings, closely packed together, with rooms facing the inner court, built as if purposely to keep out sunlight and air; the walls thick and damp, of a porous material called "mamposteria," which not only absorbs the atmospheric moisture, but also that from the soil. The floors are on a level with the ground, many even below the surface of the street. Poor ventilation, absence of sunlight, excessive moisture, the heat of the tropics, and besides the emanations from one or two uncemented cesspools in the inner court or under the rooms, are ideal conditions for the conservation and propagation of the germ when fresh material is supplied.

The ideal place to treat yellow fever is in large open tents, situated on high, well-drained soil, outside of the area of infection, with

wooden floors raised above the ground, permitting free ventilation below. Such conditions permit the maximum amount of sunshine and fresh air.

In preparing a room where a yellow fever case is to be treated, all necessary articles of furniture except such as have smooth surfaces and are easily disinfected should be removed; carpets, upholstered chairs and sofas, and curtains are especially difficult to handle after once infected, and must be destroyed.

Though it is supposed that a yellow fever patient does not infect his surroundings until two or three days after the development of the disease, when such articles are removed from the room during this period, because of the suspicious character of the case, it would be well to consider them infected and have them exposed to the sunlight and air for several days. The windows in the room should be kept open night and day, but the patient must not lie in a direct current of air nor be exposed to a sudden chilling of the surface by draughts. The greatest care must be exercised in this respect during the period of defervescence.

It is a matter now of current belief that a yellow fever case can be treated in a room or apartment without infecting his immediate surroundings, and probably without communicating the disease to non-immune persons around him, and the evidence on this point is sufficiently convincing; but to obtain these results it is necessary to comply with certain hygienic laws, and a system of bedside sanitation, to be presently described, must be rigidly carried out.

Dr. Roger Post Ames, late Acting Assistant House Surgeon, Touro Infirmary, New Orleans, and now in the U. S. Army, has furnished the writer with the following description of the yellow fever epidemic as treated in that institution during the year 1897:

"The buildings of the 'Touro Infirmary' are situated in the upper portion of the city; they are built of brick, two stories high, the first story being only a basement, and not used for hospital purposes. The arrangements for sanitation and ventilation are perfect and every room and ward gets an abundance of air and sunlight. Walls and ceilings are plastered and painted. When the first case of yellow fever appeared at the Infirmary in 1897, Dr. F. Loeber, the House Surgeon, immediately called together the four resident students, nurses, and superintendent of nurses, and explained to them that a typical case of yellow fever was in one of the wards; he stated that during his term of thirty years as House Surgeon of the Touro the institution had passed through several yellow fever epidemics, particularly the epidemic of 1878; at other times occasional cases appeared, but never at any time did a case of yellow fever originate in the hospital; very often the students, nurses, and other patients were

non-immune. All remained and faithfully performed their various duties. Not one contracted the fever. One hundred cases were admitted and treated; ten of this number died. The infirmary admitted all classes of diseases, surgical and obstetrical cases, etc., and no attempt at isolation was made. The same surgeons, students, nurses, etc., attended yellow fever cases and other diseases without changing linen; yellow fever cases were placed in wards with other patients, non-immunes, the distance between the beds being about six feet. The most malignant cases admitted were treated in the ward mixed up with other diseases, and none of the patients contracted the fever, or appeared at all alarmed, or objected in any way to having a yellow fever patient placed beside them.

The hygienic or bedside sanitation was the following: Thorough cleansing of the patients and the removing of the linen daily or as often as required. All discharges, bed-pans, articles of patients' wearing-apparel, and linen were disinfected immediately after removal. For the early and proper disinfection, tubs containing the disinfecting fluid were placed at the head of the bed ready to receive the articles removed."

The hygienic management of a case, briefly considered, consists of supplying all the fresh air and sunshine consistent with the comfort and safety of the patient; good nursing, absolute rest, perfect cleanliness, and bedside sanitation, which not only avoids local infection and a further dissemination of the disease, but which, by overcoming a concentration of the virus, probably prevents secondary infection and modifies the virulence of the toxæmia. The mortality of the cases when the hygienic conditions are bad is always high, and it lessens in the same class of cases when these are improved.

As soon as the diagnosis of yellow fever is made the patient must be put to bed, and not allowed to leave it until after complete convalescence. Both physical and mental rest is essential, and all unnecessary muscular movements should be avoided, especially during the period of defervescence, when fatal syncope is liable to occur. This rule should be imperatively observed from the beginning, no matter how light the attack, as it is not always possible to judge of the subsequent severity of the case from the symptoms during the primary stage. All medication and fluids must be administered through a spoon or feed-cup, with the patient in a recumbent position, and the excreta from the bowels and kidneys received in the bed-pan. In severe cases, marked by great prostration, when there is a tendency to retention of urine or the patient is in a typhoid condition, it will be necessary to use the catheter at stated intervals. Some patients are unable to have a normal movement of the bowels in a bed-pan, and those, of course, will have to be sup-

ported by two attendants when obliged to leave the bed. The bed should not be too wide, allowing the free handling of the patient by the nurse; and it should have a good spring and mattress, covered by an oil-cloth, over which is thrown the blanket or sheet. The patient must not be too heavily covered, as profuse perspiration is to be avoided; a light summer blanket or sheet being all that is necessary. The bed-linen and clothing must be changed daily, or as often as they become soiled in the interval, but this must be done with the least disturbance of the patient; it is preferable that the daily sponge-bath contain some mild antiseptic or alcohol. The patient's mouth should be rinsed out several times a day with an astringent antiseptic wash, and, instead of the tooth-brush, a soft rag should be substituted on account of the sponginess of the gums, as the former would be liable to cause bleeding. It is best to keep the urine voided in separate bottles, tightly corked, in order to permit examination of each specimen, since it is important to detect the presence of albumin as soon as it appears, and during the progress of the case judge of its relative increase or decrease; an accurate record must also be kept of the whole amount passed each day and the specific gravity. Much of the diagnosis and prognosis rests upon the observance of this point.

Although it is not known how the infectious agent of yellow fever is disseminated outside of the body, it is reasonable to suppose that this takes place through the fæces, urine, sweat, saliva, vomited matters, and the blood which escapes through the bowels; therefore, bedside sanitation and cleanliness must be thorough and complete. The bed-pan into which the dejecta are to be received must contain a strong disinfectant, 1 : 20 carbolic acid, or chloride of lime; and a large quantity of these must be added immediately again after it is used. The bed-linen, body-linen, and feeding-utensils—in fact, all that comes in direct contact with a yellow-fever case, or in any way may have become infected—must be immediately disinfected either by immersion in a strong solution of carbolic acid or corrosive sublimate, 1 : 500. It is preferable that the nurses or attendants be dressed in linen, and that the physician wear a gown of the same material when in the room or ward; when not in use these should be kept exposed to sunlight and air. A large tub filled with a strong antiseptic solution kept in the same room, or contiguous to it, will be found very convenient into which soiled linen can be thrown for the purpose of soaking it until ready to be washed. Nurses and attendants must pay strict attention to personal cleanliness and frequent disinfection of hands after handling the patient.

Those physicians who have had most experience in the treatment of this disease generally agree that active medication is usually not

only unnecessary but injurious. A few simple remedies and the observance of the hygienic precautions given above will be found all that is required in the great majority of cases. Throughout the South the hot mustard foot-bath and profuse diaphoresis are considered, if not by the profession, at least by the laity, as of vital importance. These, if used at all, should only be given during the congestive period, and the sweating that accompanies it should not be kept up for more than a few hours, as the disease is in no way mitigated by profuse perspiration. Orange-leaf tea or hot alcoholic drinks will promote diaphoresis during the foot-bath. The hot, dry skin and general malaise of the patient are best relieved by small doses of one of the coal-tar products, antipyrin, 5 grains (0.30 gm.), or phenacetin, 8 grains (0.50 gm.); but these should not be repeated more than two or three times during the paroxysm, and should be used more with a view to their sedative than antipyretic effect. Coal-tar preparations are contraindicated when there is already pronounced prostration with a leaky skin.

In Havana and throughout the South American countries the preliminary emetic is customary; but it should not be used unless the attack occurs immediately after a meal and the stomach is known to be loaded with undigested food; unless this condition is present it is contraindicated, since nausea, vomiting, and an irritable stomach are the usual distressing symptoms to be overcome later on in the course of the disease, and an emetic given at this time may intensify them. The best emetic is powdered ipecacuanha, 15 to 30 grains (1.00–2.00 gm.), followed in fifteen minutes by warm water to facilitate emesis.

The selection of the purgative will always remain a matter of choice with the attending physician; no drug has a specific effect in this disease, and all that is necessary is a brisk, quickly acting cathartic, that will effectually clear out the alimentary tract without causing undue irritation of the gastro-intestinal mucous membrane, or have a tendency to increase nausea or vomiting. Calomel and castor oil are the ones most commonly used, but the former has the advantage of not only being more easily administered, but as the best of all intestinal antiseptics it is especially indicated in a disease in which the deadly toxin is supposed to develop primarily in the gastro-intestinal tract. This drug is prescribed either in one or two large doses, 10 to 15 grains (0.60–1.00 gm.), followed in a few hours by a saline purge or other laxative; or is given in smaller and divided doses: calomel, grain $\frac{1}{4}$ (0.01 gm.), bicarbonate of sodium, grain 1 (0.06 gm.), repeated every fifteen or twenty minutes until 3 grains are taken, and then followed by a saline. In a majority of cases not only will this insure a thorough evacuation of the bowels, but it will

usually allay gastric irritability and nausea. The calomel and soda should be freshly prepared, as old pills and tablets are not so effectual. Castor oil is a very efficient and unirritating purgative, being very generally used in Havana. By the laity it is supposed to possess even specific properties in yellow fever; but it is so repulsive to a majority of persons that it may not be retained by the stomach. The usual dose is 1 ounce (30.00 gm.), given with glycerin, sweet almond or olive oil; but much larger doses, 3 to 4 ounces (90.00–120.00 gm.), are frequently prescribed. Of the numerous methods suggested to disguise its disagreeable taste, pouring the oil on orange-juice or coffee and having the patient rinse out the mouth with raw brandy before swallowing, is one of the best; instead of brandy, peppermint may be substituted, and if the oil is previously warmed it is even more readily swallowed.

There is much difference of opinion as to how frequently the purgative should be repeated; some physicians administer small doses daily throughout the whole course of the disease, believing that not only are the crippled liver and kidneys relieved of much of their eliminative work, but also that the *materies morbi* is got rid of by repeated evacuations; but as it is well known that excessive purgation increases depression, the majority of practitioners depend upon the high enema to produce a daily movement of the bowels. When there are epigastric distress and distention from accumulated gases, small doses of calomel, grain $\frac{1}{30}$ (0.002 gm.), given every few hours, will not only relieve these symptoms, but will be found very effective in stimulating the kidneys to greater activity.

After the preliminary purgative the bowels should be daily irrigated with one or two quarts of warm, previously boiled, water given through a rectal tube or long soft-rubber catheter, with the fountain-syringe suspended not more than two feet above the patient; the temperature of the water must be regulated by the degree of fever, but should never be much below 90° F. when used for the purpose of irrigating the bowel. Some physicians place much reliance upon these daily irrigations, and if the bowels are very torpid substitute a purgative enema of sulphate of sodium or magnesium.

When the vomiting is persistent and uncontrollable, it may be necessary to give the stomach complete rest and depend entirely upon enemas to satisfy thirst and supply fluids; but whenever it is intended that the injection be retained a normal salt solution must be used.

The free use of water in this disease is indispensable; the patient must be encouraged to drink the largest quantity possible, not only to allay thirst, but also to stimulate the kidneys to activity. Whether this be given hot or cold, in small or large quantities, depends entirely upon the feelings of the patient and the cravings of Nature; no

definite rules can be laid down, but there are some minor points not to be lost sight of; for example, many patients will crave liquids more to allay gastric irritability than to satisfy thirst, and as a result the stomach rebels and vomiting ensues; in others very cold water or pieces of cracked ice frequently swallowed will produce insatiable thirst; on the other hand, hot water will be more agreeable to some than cold, and will even allay gastric distress. In all such matters judgment must be exercised. The indications for the liberal use of water, besides its febrifuge properties, are for its well-known diuretic effect. Not only will it increase the watery parts of the urine, but also the urea, which is always greatly diminished in this disease. It is also supposed to aid in the elimination of the toxic material in the blood.

On account of the highly acid condition of the urine and contents of the stomach, alkaline mineral waters are usually given in place of plain water. Vichy, Seltzer, Apollinaris, Poland, or plain water to which has been added 1 drachm (4.00 gm.) of bicarbonate of sodium to the pint, are the ones most commonly employed. Waters highly charged with carbonic acid gas are preferred, but the local stimulating effect of the gas on the gastric mucous membrane will not infrequently add to the distention of the stomach and produce gastric uneasiness.

During the paroxysm, or period of congestion, there are certain symptoms which from their severity or prominence may require treatment. These are fever, persistent vomiting, cephalalgia, rachialgia, and more rarely great restlessness, active delirium, and insomnia. In regard to the first, pyrexia, we can do no better than quote the opinion of Sternberg on this point: "In the present state of knowledge a carefully managed symptomatic treatment will give the best results obtainable, and will do much toward reducing the mortality. We have pointed out the fact, in speaking of prognosis, that the temperature of the body, as shown by the clinical thermometer, is a fair index of the severity of the attack. It does not follow from this that the high temperature in severe cases is, *per se*, a cause of danger. If this were true, the evident indication would be to keep down the temperature by means of cold baths or antipyretic medicines. The intensity of the pathogenic action of the specific poison is indicated by the height and duration of the febrile movement; but we do not neutralize the pathogenic action when we reduce the temperature of the body. In malarial fevers the temperature frequently rises to a higher point in cases which are not attended with any special danger; nevertheless it is desirable that this symptom, high temperature, should receive proper treatment, and a reduction of the febrile heat is usually attended with an amelioration of other more

or less distressing symptoms—thirst, headache, sleeplessness, jactitation, etc."

As a rule, temperatures below 102.5° F. require no special treatment, and even those of 103° F., if the patient shows no other symptom and is comparatively comfortable, had best be left alone; but when these are accompanied by a dry, hot skin, with restlessness, sleeplessness, and headache, sponging with tepid or cold water to which has been added alcohol or vinegar must be tried before resorting to stronger antipyretic measures; they should be repeated every three or four hours, with the least disturbance to the patient. In applying these baths, it is necessary that the sponge be only wet enough to leave on the skin a thin film of moisture, which by its rapid evaporation cools the patient, the hot blood from the interior being brought to the surface by the continuous rubbing. So long as the skin remains hot and dry and the temperature elevated the sponging must be repeated at stated periods; during the intervals an ice-bag or cold wet compress should be applied to the head. Frequent bathing of the face and hands will add greatly to the comfort of the patient. A thorough, properly applied sponging with cold water will in the majority of cases bring about a sufficient reduction in the temperature; but if hyperpyrexia accompanied by nervous symptoms or evidence of cerebral congestion are present, resort must be had to the cold bath in preference to the use of any of the coal-tar antipyretics, which, although more easily administered, are not as safe. Excessive temperatures frequently require repetition of the antipyretic, and in this lies the danger of the use of these coal-tar preparations. If given in sufficient doses to control the fever, they not only depress but at the same time decrease the resistance of the patient to the infectious agent, and, besides, their subsequent elimination is an added burden to the kidneys. The cold bath, on the other hand, if properly given, not only reduces the temperature, but by its tonic effect on the vaso-motor system and general circulation stimulates the kidneys to greater activity.

The successful application of the bath in this disease, as in all others, requires the strict observance of certain rules. Two persons are needed to administer the Brand bath properly. The water in the tub should be of a uniform temperature before the patient is placed into it, and not first warm and subsequently cooled by the addition of cold water; the proper temperature is between 70° and 75° F., and the water must be sufficient in quantity to cover the patient when immersed. While in the bath the rubbing of the whole surface of the body must be thorough and continuous, as in this more than in any other one factor lies the secret of successful tubbing. A cold compress must be kept applied to the head and the temperature taken

in the mouth or rectum every few minutes. The bath should never exceed twenty minutes in duration, even if the temperature is not reduced to the desired point, 102° F., in that time. The patient after being thoroughly dried with a rough towel should be allowed to react while lightly covered with a sheet or thin blanket, and not burdened with quilts or hot-water bottles.

The cold bath may be used in yellow fever only when the temperature is exceptionally high and does not yield to sponging. It is always contraindicated in the old and feeble, or in such as are not liable to react; nor must it be used when the febrile stage is approaching its termination, or in the hyperpyrexias which occur during defervescence. If used during this period, the patient would probably not react, collapse would ensue, and the congestion of the internal organs would be intensified.

In very young children, in whom the disease may be ushered in with convulsions and high temperatures, the tepid bath or sponging with warm water is preferable. Cold water enemata may be also used to reduce the temperature.

In the place of sponging for the reduction of fever many physicians employ such antipyretic drugs as antipyrin, phenacetin, or acetanilid; as analgesics they are probably indicated during the primary stage, and if repeated not more than once or twice are free from danger, but the value of their general use as antipyretics in yellow fever is doubtful.

Nausea and vomiting may be excessive from the inception of the attack, and may continue as the most distressing symptom throughout the entire course of the disease. After the thorough emptying of the gastro-intestinal tract, if these symptoms persist, it may be well to try shaved or cracked ice in small quantities of alkaline waters, such as Vichy, Seltzer, Apollinaris, or ginger-ale, repeated at frequent intervals, at the same time applying mild counter-irritation to the epigastrium. Some patients prefer sips of very hot water instead of cold; this may be acidulated with lemon-juice to render it more palatable.

If such methods fail to give relief, all fluid must be withheld from the stomach for several hours and enemas of normal salt solution used to assuage thirst. Blisters to the epigastric region are unnecessary and not so agreeable to the patient as properly applied rubefacients, which are just as effectual. Mustard (one part to ten of flaxseed) directly applied to the epigastrium and allowed to remain ten or twelve hours will produce a uniform and persistent redness of the skin, but camphor or menthol and oil, or an ice-bag, may be used in its place.

In treating this symptom we must remember that nauseating or

disagreeable odors will increase the tendency to vomit in sensitive persons, and even the insertion of the thermometer under the tongue may be sufficient to intensify these symptoms. If, notwithstanding such simple remedies, nausea and vomiting persist, certain drugs may be cautiously administered, such as cocaine, aconite, creasote, or carbolic acid; but we must refrain from excessive medication. The vomiting of yellow fever during the congestive period is either reflex, from the irritation of the nerves of the stomach by the toxin, or by that circulation in the blood and directly exciting the vomiting centres, or it may be one of Nature's many avenues of elimination. During the stage of defervescence it is probably caused either by hyperæmia and inflammation of the mucous membrane or the uræmic poisoning.

Dr. Thorington, of Colon, introduced cocaine as an antiemetic and stimulant in this disease, giving it in doses of 2 to 3 grains (0.12–0.18 gm.) in solution. Others who have used it prefer smaller doses in tablet-form. Hare cautions against the poisonous effects of this drug if given too liberally; he directs that in hyperemesis 2 to 3 drops (0.1–0.15) of a 4 per cent. watery solution be given every fifteen minutes until 10 drops (0.65) are taken.

If there is a tendency to nausea, the following prescription has been found of value by the writer:

R. Cocainæ hydrochloratis, gr. j (0.06 gm.);
Caffeinæ citratæ, gr. xij (0.75 gm.);
Antipyrini, gr. xxiv (1.50 gm.);
Aquæ, q. s. ad ℥vj (180.00 gm.).—M.
Sig.—Tablespoonful (15.00 gm.) as directed.

Creasote and carbolic acid are excellent antiemetics on account of their local anæsthetic and antiseptic properties, but owing to their disagreeable odor and taste are not readily taken or even retained by persons suffering from nausea.

Such symptoms as backache, headache, and epigastric pain are in some cases so intense that they overshadow all others and require special measures for their relief. The sufferings of the patient may be such as to necessitate the administration of sedatives and analgesics. Such local measures as cold applications, sinapisms, frictions, or the hot-water bag will often afford relief; but if they do not, antipyrine will be found the best drug to use under these circumstances. The dose of 5 grains (0.30 gm.) should not be repeated more than once or twice, and it is best combined with citrate of caffeine, 1 to 3 grains (0.06–0.18 gm.).

As analgesics, the coal-tar products are far superior to opium; and the latter should be used in this disease only under very exceptional

conditions, as in maniacal delirium, and only after other means have failed. Not only does this drug check all the secretions of the body with the possible exception of the skin, but it also produces constipation, increases the tendency to nausea, and decreases the amount of urea in the urine—the very conditions it is necessary to overcome in a patient suffering from yellow fever.

In 1887 Sternberg introduced a system of treatment by alkalies and corrosive sublimate, hoping thereby to neutralize the acid secretion of the stomach, and, if possible, prevent the nausea and vomiting; also that it might have a favorable effect on the kidneys and decrease the acidity of the urine. He also advised the administration of a moderate quantity of ice-cold water at stated intervals. The original formula:

℞. Sodii bicarbonatis, gr. cl (10.00 gm.);
Hydrargyri chloridi corrosiv., gr. $\frac{1}{3}$ (0.02 gm.);
Aquæ puræ, Oij (1000.00 gm.).—M.
Sig. Three tablespoonfuls (50 c.c.) every hour.

is, with one or two exceptions, no longer used in Havana, but since the treatment was first introduced in the island the majority of physicians prescribe bicarbonate of sodium in continuous doses throughout the course of this fever, adding the drugs for which they have some personal predilection.

Medical thought in Havana, as well as in all South American countries, is led entirely by that of the French school of medicine, and since the teachings of Bouchard on auto-intoxication, the theory that the toxin of yellow fever is elaborated, and that the secondary infections originate in the intestinal tract, has taken so strong a hold on the mind of the medical profession that the thorough and persistent disinfection of the gastro-intestinal tract is the routine treatment followed by many practitioners here. Many facts, it is true, point to the probable truth of this theory, but unfortunately the mortality of the disease has not decreased under such treatment, and the enormous doses of intestinal antiseptics recommended cannot but prove harmful in many cases. Salol, beta-naphthol, hyposulphite of sodium, salicylate of bismuth, and a host of others have been used.

Quinine for many years was administered at the outset of an attack of yellow fever, with the idea of aborting or modifying the severity of the paroxysm. Its use has been now generally abandoned by the profession for that purpose; but if there is an indication of the coexistence of malaria with the disease then one or two moderate doses should be given during the congestive period; the bimuriate of quinine, given hypodermically, will be found very effective.

Treatment of the Stage of Defervescence.

Cochran ably expresses it when he says: "Just as the chill is the introduction to the stage of effervescence, so is the calm the introduction to the stage of defervescence. It is sometimes so little marked as not to attract special attention; sometimes it is of very brief duration, lasting only an hour or two; and sometimes it is protracted to twelve hours or more. It is one of the most notable features in the evolution of a case of yellow fever, and is in strong contrast with the stormy manifestations that have preceded it. In the milder cases it is the immediate prelude of convalescence, but in most cases of the typical form it is simply the beginning of the stage of defervescence, which runs through a course of from three to six days. While the calm lasts but little is necessary in the way of treatment; the patient must be kept in bed. . . . As Dr. Wall phrases it, 'We may pursue a course of masterly inactivity, waiting to see which way the scales will turn.'"

We have now reached the critical period of the disease, when in many cases the life of the patient depends upon careful nursing and skilful management. The stage of defervescence is the state of depression, hemorrhages, suppression of urine, and syncope. Absolute and perfect rest must now be enforced more rigidly than during the primary stage, as fatal syncope may occur at this period. No matter how mild the type, this rule should be invariably enforced, the fact kept constantly in mind, and measures taken to avoid the occurrence of such an accident.

A perplexing question now comes up, and one which always taxes the ingenuity and good judgment of the physician: At what period of the stage of defervescence and in what form are we to begin the administration of food? On this point there still exists great diversity of opinion.

No definite rules can be laid down, because no two patients or cases are alike. A strong, vigorous man may not require food or stimulants for four, five, or six days; but weak and debilitated subjects must be nourished and stimulated soon after the beginning of the stage of defervescence. The deprivation of food in this disease has been carried to excess by many physicians. Children require food much earlier.

If after the period of calm there is a progressive increase in the amount of albumin in the urine and hemorrhages from the stomach or bowels appear, it would be worse than useless to begin the administration of food by the mouth. Under these circumstances it is best to depend entirely upon nutrient and stimulating enemas. On the other hand, if the albuminuria decreases or is slight in amount, if the

craving for nourishment becomes more or less urgent, and if the patient's general condition shows signs of improvement, it is safe to begin the cautious administration of fluid and semi-digested food. A teaspoonful or two of cold peptonized milk, alone or with equal parts of carbonated water, may be allowed every hour, increasing the amount as the patient shows more tolerance for this food; but if the stomach rejects it, it may be necessary to wait twelve or twenty-four hours before making another attempt and resort to rectal feeding, rather than run the risk of increasing gastric irritability. It is in the mild cases that errors of this character are likely to be committed; for in severe types of the disease, in which the toxæmia is intense, the patient usually has no desire for food.

Although the majority of physicians consider milk, on account of its diuretic properties, far superior to any other food, many others hold contrary views, and prefer animal broths, either mutton, chicken, or beef, hot or cold as the patient may desire it. The value of milk as a food and its successful administration in the presence of fever or a weak digestion depend upon preventing its coagulation into thick, tough curds after it enters the stomach, otherwise it becomes a solid food difficult of digestion. This may be avoided by its previous dilution with lime-water or carbonic acid water, plain bottled soda, or Apollinaris, Vichy, or bicarbonate of sodium, one or two grains to the ounce. But it is preferable to have the milk previously peptonized or pancreatized for one or two hours, or until it has become bitter from development of an excess of peptone; then boiled, strained, and kept on ice. If it has been properly prepared in this manner, it will not coagulate on the addition of muriatic acid. The bitter taste may be partially disguised by lemon-juice, brandy, or whiskey, but usually patients readily take it if given sufficiently cold. Malted milk and buttermilk have also been highly recommended.

Besides the daily lavage of the lower bowels with the high rectal tube and a solution of boric acid and salt (two teaspoonfuls of each to the quart of boiled water), it may be necessary to use nutrient enema. In administering these, certain rules should be observed: The injections should always be given through a long rectal tube or flexible rubber catheter by means of a hard-rubber syringe, so as to reach the highest portion of the lower bowel. The quantity should not exceed three ounces, and it must be warm or of the temperature of the body when administered. The injections should not be repeated more than once every six or eight hours, the lower bowel being washed out at least once every twenty-four hours.

Stimulants are indispensable in yellow fever when exhaustion and prostration occur, no matter at what stage of the disease; they are nearly always indicated after the fourth or fifth day, but should never

be given in excess. If not retained by the stomach, they must be given by the rectum or hypodermically. Usually champagne frappé, brandy with cracked ice, or ginger-ale will not only not be rejected, but may even allay nausea and vomiting. Rhine wine is highly spoken of by Blair; he claims that it is retained when everything else is vomited.

The indications for the use of alcohol are twofold: as a stimulant and as a food; but only that amount should be given which will improve the action of the heart and relieve the nervous phenomena so common during the stage of depression. In the majority of cases small repeated doses will be sufficient; but when there are great prostration, sighing respiration, low, muttering delirium, rapid, feeble pulse, dry tongue, etc., symptoms of a profoundly adynamic state, much larger quantities will be indicated. Infants and elderly persons or those who have been habitual drinkers will require stimulation much earlier in the disease.

A good rule to follow in all asthenic fevers of this type is to withhold stimulants until there is a clear indication for their use, and then to give them in sufficient quantity (which may vary from an ounce to a pint or more per day) to produce the required results. Alcohol in excess is a depressant, and that which is not oxidized in the body is partly excreted by the kidneys. When the albuminuria is abundant and the kidneys are not acting freely it is safer to suspend its use entirely or decrease the amount to a minimum, sustaining the enfeebled heart by hypodermics of strychnin, digitalin, or citrate of caffein.

The three most common causes of death in yellow fever are hemorrhage, uræmia, and syncope. The efforts to combat these should begin from the moment the patient is prescribed for. Every plan of treatment adopted, every effort made to sustain the strength of the patient, every dose of medicine administered, should be with the object of preventing or modifying if possible one of these accidents. All are caused by the same infectious agent, whose morbific influence and progress cannot be arrested; but every assistance should be given the patient to resist and withstand the visceral changes which are the result of its toxæmia. It is true that some cases die without demonstrable evidence of one of these three accidents having occurred—in fact, without apparent cause, since even the post-mortem reveals no definite or sufficient lesions pointing to the cause of death; but probably in these cases the toxin had expended its force on the central nervous system.

Hemorrhage from the gums, unless very severe, requires no treatment other than absolute cleanliness of the mouth and its careful rinsing before the administration of liquids. A mild antiseptic astringent solution, such as listerine, tincture of myrrh, or honey

and water to which have been added a few drops of carbolic acid, makes a pleasant mouth-wash.

Hemorrhage from the stomach and bowels is a much more serious symptom—fatal if accompanied by uræmia; but black vomit in itself does not imply the certain death of the patient if the other symptoms are favorable.

For the control of hæmatemesis the milder remedies should first be tried, such as bits of cracked ice frequently swallowed, small doses of champagne frappé or ginger-ale, and an ice-bag or sinapism over the epigastrium. If the hemorrhage shows a tendency to recur, the stomach must be given absolute rest and all liquids be administered by enema. It may even be necessary to resort to hypodermic injections of large doses of ergot or tincture of the chloride of iron, 20 to 30 drops (0.50–1.00 gm.) every two or three hours. Hammamelis, acetate of lead, Monsell's solution, and a host of others have been tried with varying success. It is well to bear in mind in using these remedies that when hemorrhages appear the bloodvessel walls and capillaries have already undergone fatty degeneration, and that the mucous membrane of the gastro-intestinal tract, and such important excretory organs as the liver and kidneys, have not only suffered the same change, but are also irritated and inflamed; therefore they should be given with extreme caution.

When the loss of blood has been great, hypodermoclysis may be tried to tide the patient over a short period.

Uræmia, as is well known, is the most common cause of death in this disease. It is generally taught that a partial or complete suppression of the urine is the symptom by which we recognize this condition, and that as long as the patient is passing from one to two quarts per diem he is comparatively safe; but frequently patients die uræmic who up to a few hours before death had been excreting the normal quantity of urine. Unfortunately, under the term of uræmia, especially as applied to yellow fever, is hidden a complexity of phenomena which cannot always be accurately judged, either by the quantity of urine passed, its specific gravity, or the amount of albumin present. The difficulty lies in the fact that the extensive fatty degeneration so characteristic of this disease must cause so much interference with the normal activities of the liver as an excretory and secretory organ, that even if the renal epithelium be stimulated to excrete all the toxic substances which are at that time in the blood and which it is part of its physiological function to eliminate, the hepatic cells, from the character of the changes they have undergone, may not be able to continue their metabolic activities and so transform many of these toxic products as will permit of their excretion by the kidney, skin, or bowel.

It is well to bear in mind that the lack of permeability of the kidney cannot be judged alone by the quantity of liquid excreted, its specific gravity, or even the amount of albumin. Though clinically its specific gravity, the amount of the albumin from day to day and hour to hour is the best guide we possess to possible urinary suppression, a sudden or progressive increase signifies an extremely dangerous symptom.

The diagnosis and prognosis of a case of yellow fever will largely depend upon the care with which the examinations of the urine are carried out. A record of the daily amount, the specific gravity, the presence of albumin and bile-pigments are the points to be carefully considered. For the detection of albumin, the boiling and nitric-acid tests—Heller's test—are the ones more commonly used; but it is well to bear in mind that, if the first of these is employed, the urine must have an acid reaction before being boiled, and if it is necessary to acidify it that the minimum quantity of acetic acid be added, lest the albumin be converted into acid albumin, which is not coagulated by heat. For quantitative estimations, Esbach's albuminometer should be used; this gives the weight of albumin in parts per thousand of urine, or so many grams per litre. Another method of judging of the relative quantity of albumin is to have each sample boiled in test-tubes and put aside for twenty-four hours; the albuminous layer deposited can be compared with the total depth of urine in each tube; but this does not mean that the urine contains so many parts by weight of albumin, a mistake frequently made.

We have three methods of combating uræmic symptoms: first, by sweating the patient either by baths of hot, dry air or hypodermics of pilocarpin; secondly, by purgatives; and, thirdly, by diuretics, such as digitalis, diuretin, caffein, turpentine, etc. By the first method the amount of urine is at once decreased; and as it is not possible for either the bowels or skin to eliminate all the toxic products which it is the normal function of the kidneys to excrete, such attempt should be made with the greatest care, much more so in a disease in which debility and exhaustion are so prominent a feature; excessive purging and sweating are always accompanied by depression.

As to the propriety of using diuretics in uræmia, Bouchard says: "When the impermeability of the kidneys has become such that they cease to have the power of eliminating toxic substances, there are then retained the medicinal substances: the kidney is as impermeable for therapeutic poisons as for natural poisons, and the employment of toxic medicines in similar cases has no other effect than to bring about an association of medicinal intoxication with a uræmic."

When tendency to suppression becomes manifest during the course

of an attack of yellow fever an attempt should first be made to overcome it by counter-irritation to the loins with sinapisms or by the application of dry cups, accompanied by large enemas of normal salt solution. If this complication becomes more pronounced, one is justified in employing diuretic medicines; but generally all such attempts fail and anuria will supervene.

Guitéras speaks highly of calomel, and considers it the most certain diuretic we possess; he gives it in doses of 2 or 3 grains every four hours in capsules, either alone or in combination with small amounts of compound jalap powder. Turpentine is also highly recommended by some authorities, the usual dose being 5 drops every two hours; but much larger amounts (15 to 20 drops) have been administered.

Hypodermoclysis and transfusion have also had their trial; but it is a well-nigh hopeless task to overcome total suppression, although some well-nigh hopeless cases have been saved by heroic doses of calomel—40 grains (2.60 gm.).

Sudden collapse is an accident brought about by various internal and external causes; it may occur at any time during the stage of defervescence or convalescence, especially during the morning hour, when the patient's strength is at its lowest ebb. It is a condition more easily avoided through proper precautions than remedied after it has once occurred. Stimulants—small doses ($\frac{1}{60}$ gr.—0.0001 gm.) of strychnine or citrate of caffein—should always be given at stated intervals during the stage of defervescence to patients whose hearts show the slightest evidence of weakness or irregularity.

If syncope occurs, it must receive prompt and appropriate treatment: hypodermics of strychnine or camphorated oil and ether, brisk rubbing of the extremities, and enemas of strong black coffee and brandy.

The active delirium and restlessness of some cases during the congestive period, if accompanied by moderately high temperatures, are best treated by sponging, counterirritation, and cold applications to the head. The delirium of the second stage usually requires moderate doses of stimulants for its relief; if sleeplessness is a marked feature, it may be necessary to give chloral and bromide per rectum and to apply an ice-bag to the head.

Convulsions may occur in children as an initial symptom, for which chloroform, chloral, a warm bath, and other appropriate treatment will be necessary; this accident is usually a late manifestation in adults caused by uræmic poison.

Persistent hiccough is a grave complication, an evidence of profound toxæmia, for the relief of which musk is an excellent remedy. Sips of very hot water will frequently relieve this distressing symptom.

Convalescence.

The rapidity with which patients recover after even the most severe attacks of yellow fever is one of the marvels in connection with this disease. The liver, kidneys, and other organs resume their normal functions in a surprising manner considering the pathological changes they have suffered. The pulse usually continues slow and weak for some time, and the jaundice may persist for days; but the appetite is quickly re-established. Many patients have an intense craving for food immediately after the stage of defervescence, *but the greatest care should be exercised in regard to diet, as relapses are not uncommon, and they usually prove fatal.* The utmost caution is necessary in feeding yellow fever convalescents. In mild cases solid food may be allowed after the fifth or seventh day; but those who have suffered from a severe attack should not be permitted to have anything but liquid and soft foods for ten days or two weeks, such as malted or semi-peptonized milk, liquid peptonoids, milk-toast, broths, soups, eggs, and jellies. The patient should not be allowed to get out of bed until the heart has fully recovered its strength, and this may be greatly hastened by the judicious use of full doses of nux vomica in wine of coca. Cases that fall into a typhoid condition require stimulants in larger quantities, and the administration of iron in the form of tincture of the chloride or Basham's mixture, with the addition of strychnine, and a nutritious and easily assimilated diet of milk and eggs.

During convalescence the compound syrup of the hypophosphites and the elixir of iron, quinine, and strychnine are excellent tonics.

After severe attacks patients must be kept under observation for several weeks and frequent examinations made of the urine.

The serum-treatment of yellow fever may be said to be as yet in its infancy. The fact that the disease is infectious and confers immunity from further attacks has maintained the theory of a bacterial origin in the minds of most investigators; this naturally led to efforts being put forth in the direction of antitoxic treatment.

The first one, probably, who worked upon this theory was Dr. Charles J. Finlay, of Havana, Cuba. His method was to obtain serum by means of blisters upon the arm or chest of yellow fever immunes, which serum he afterward injected subcutaneously, both to recent immigrants, supposed to be non-immunes, and to individuals suffering from the disease. Finlay subjected three patients to this treatment; two of the cases died. He then wisely discontinued its use and limited himself to injecting only individuals presumably susceptible to the infection.

This attempt, aside from the doubtful sense of security which it brought to those immunized (?), gave such little promise of success that it has neither been repeated nor further considered by any one else.

The announcement of the discovery of the yellow fever germ by Prof. G. Sanarelli led us to hope, as promised by the discoverer, that an antitoxic or protective serum might be produced which would rob this sickness of its terrors, just as the antidiphtheritic serum has done for diphtheria.

Without taking into consideration the fact that late evidence seems to shows that the Bacillus icteroides is but indirectly related, if at all, to yellow fever, the serum prepared under the direction of Sanarelli, if not actually harmful, has proved to be of very doubtful value.

We are unable to obtain any official information as to the results from the use of this serum, and what little we possess has been gathered in conversation with fellow practitioners, who employed it upon one or two occasions, but quickly stopped its use, for the reason that it apparently did not affect the course of the disease, while a proper trial of the serum prohibited the administration of other drugs at the same time.

A letter from Dr. J. B. Lacerda, of Rio Janeiro, dated January 20, 1899, to Surgeon-General George M. Sternberg, U. S. A., says: "Although the Sanarelli serum may still be considered *sub judice* on account of the scarcity of literature upon the subject, another serum prepared from his Bacillus icteroides, and lately tried at Vera Cruz, Mexico, was attended with disastrous results." We refer to the Doty-Fitzpatrick serum manufactured in New York, at the laboratory of the Health Officer of the Port, from a culture received from Prof. Sanarelli.

Dr. Barnard E. Baker was intrusted with the trial of this serum, and was assisted by Dr. A. Matienzo, from whose official report we obtain the following data: "There were six cases of yellow fever experimented upon, three of which died in spite of having received the serum at a comparatively early stage of the disease; one of the fatal cases on the second day, before the presence of albumin in the urine could be detected. The quantity injected in each case (intravenously sometimes, subcutaneously at others) varied from 96 c.c. to 240 c.c. One individual (Case III.) received 180 c.c. in twenty-four hours." The injections, according to the report, produced great irritation of the region injected. The clinical picture of the disease was not affected in any case, and it seems unnecessary to dwell further upon this trial, the results of which ought to put an end forever to such dangerous experiments with this serum.

The latest attempts at serum-therapy in yellow fever have been

officially reported by Dr. Aristides Agramonte, U. S. A, at Havana, Cuba. His serum was obtained from men who had lately suffered an attack of yellow fever, and who were therefore immunes. Agramonte argued that these immunes (by virtue of an attack of the disease) contained in their blood an antitoxic principle which might prove curative. The method employed in obtaining the serum is that of the old-time bloodletting, under strict antiseptic precautions, and the subsequent separation of the clot and serum, just as is done in getting diphtheria-antitoxin from inoculated horses. Five cases are reported, with one death; the fatal case was first injected after the fourth day of the disease.

Two things have been prominently brought out in the four cases that were cured through the exclusive use of the serum: (1) the remarkable absence of the hemorrhagic tendency so persistent and peculiar to this disease, and (2) the rapidity of the convalescence. This natural human serum is absolutely innocuous, as demonstrated by Dr. Agramonte on his own person, being quickly and painlessly absorbed when injected under the skin. At no time were there more than 60 c.c. of the serum injected into any case, and the results induce the originator of this method to believe that this serum may also be prophylactic, probably even in smaller doses. Subsequently to the publication of his official report, Dr. Agramonte has reported four more cases of yellow fever successfully treated by subcutaneous injections of immunes' serum.

I desire, before closing this article, to add to it a description of the measures to prevent infection of environment by yellow fever patients, kindly prepared for me by Dr. H. R. Carter, of the Marine-Hospital Service of the United States.

It is generally (not universally) conceded to be correct:

1. That yellow fever is not directly transmissible (like measles, for example) from the sick to the well.

2. That one sick of yellow fever will so affect his environment (bedding, room, etc.) that others susceptible to the disease, living in this environment, will develop it.

3. That this infection of the environment is conveyed from the patient by means of emanations from him other than gaseous.

4. That it takes some time (in days) before the environment is thus rendered capable of inducing the disease in others.

On these principles, and those of ordinary antisepsis, are founded the measures adopted to prevent infection of the environments of yellow fever patients; and hence the development of that disease among those exposed thereto. Independently of theory, these measures have proved almost universally successful to this end in hospitals,

and measurably so in private residences, where they are far less perfectly carried out.

We should aim to place a patient in a clean room and to keep it clean; this is the whole matter. The ward or room in which the patient is to be treated must be clean, dry, well ventilated, and sunny, with bare floors; and contain no fabrics nor upholstered furniture which can be dispensed with. On the bed should be placed a rubber sheet to protect the mattress, and a folded draw-sheet across the middle. All of the clothing worn by the patient must be removed on arrival, and he be given clean underclothing. It is advisable (necessary if sick some days) to give him an antiseptic sponge-bath (generally best hot). Corrosive sublimate solution or alcohol is usually used, paying special attention to the hair, cleft of nates, etc. Change body- and bed-linen once a day—oftener if soiled; change the rubber sheet or disinfect its surface at the same time.

Everything coming in contact with the patient, especially fabrics (sheets, handkerchiefs, etc.), as well as spoons and drinking-cups, should be sterilized immediately after use, usually by immersion in a bichloride solution (kept in the room or near at hand). All excreta should be disinfected and destroyed. Wipe up the floor daily with a disinfecting solution. In short, adopt every detail to prevent contamination of the environment by the excreta of the patient.

It is advisable (but not usually practised) to repeat the antiseptic sponge-bath at intervals; this is necessary if the patient's person be soiled. In hospitals the results have been about perfect; in private houses less good, but still favorable.

Disinfection.

Of course, premises treated as just described need no disinfection; they have not become infected. The methods of treating infected premises can only be outlined here. The problem is to disinfect sufficiently, with a minimum injury; mere efficiency anyone can obtain by fire.

Unless the disinfector be experienced, it is well to do as much burning, wetting, and soaking in antiseptic solutions as possible, using gaseous disinfectants as adjuvants. For gaseous disinfection (formaldehyde and sulphurous acid gas) the house must be air-tight, or be made so. For bulky fabrics (cotton quilts, mattresses, pillows, beds, etc.) gaseous disinfectants cannot be depended upon if more than their surfaces be infected.

The writer would state that his observations lead him to have full faith in the use of sulphur dioxide for yellow fever if properly used; also, it has been his experience that this agent very rarely is properly

used except at maritime quarantine stations. He has full faith also in the efficiency of the aëration of fabrics.

Prolonged exposure to sun and air (reasonably dry air) will disinfect any ordinary fabric contaminated with the excretions of a yellow fever patient as completely as burning; and if the choice be between gaseous disinfection as usually applied and aëration the author would, by all odds, prefer aëration. Of course, the location of the premises is frequently such that aëration of infected fabrics is not possible. The house should be kept open, well ventilated, and dry after disinfection.

Assuming, then, that the reader is familiar with the details of the process of disinfection, only the salient points will be indicated:

Fabrics.—Steam is the method of election. Formaldehyde for light fabrics. As the penetration of this gas (formaldehyde) cannot be depended on, articles to be disinfected by it must be very thinly spread or hung. If used in high percentage (10 to 15 per cent. volume), with vacuum and dry heat (80° to 90° C.), its penetrating power is greatly increased, and we have an efficient and non-injurious method.

Rooms.—The use of formaldehyde in the room and mopping the floor with bichloride solution are the methods of election. Sulphur dioxide is efficient for yellow fever, but frequently injures. Wetting all over with bichloride solution is at times very injurious, but is necessary where the room cannot be made gas-tight.

Outdoors may require no disinfection; if it does, collect all waste near the house and burn it. Wet this part of the ground thoroughly with the bichloride solution—making mud of it, and burn the surface of the remainder, preferably by a gasoline furnace. The bichloride is used where it is impracticable to use fire.

The **contents of vaults** should be treated very liberally with a bichloride of lime solution or carbolic acid. Of course, if the vaults can be sealed up so much the better. Should fæcal matter be above the surface of the ground, it has been the practice of the writer to burn it.

It is fair to say, however, that with clear, dry weather, in a clean, dry ward (not on the ground floor), well exposed to sun and wind and kept mechanically clean, and the bed- and body-linen kept clean, and the excreta properly disposed of, we frequently (I believe we may say generally) escape infection of premises without the use of chemical disinfection. The sun, air, and dryness seem all important.

DENGUE.

By J. W. McLAUGHLIN, M. D.

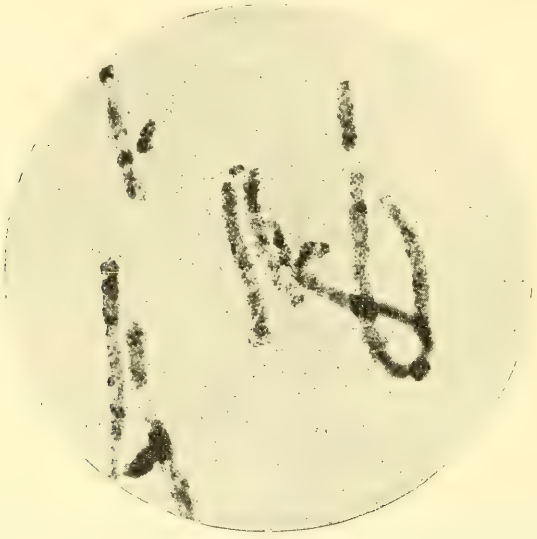
Definition.—Dengue is an infectious fever caused by a specific micro-organism—probably the micrococcus of dengue. The disease is characterized by a polymorphous eruption as well as by severe neuromuscular and arthritic pains. Persons of all ages and of either sex are subject to attacks of this malady, which, though rarely fatal, is marked by a slow and tardy convalescence. It is endemic in some localities, such as Calcutta, where, at certain variable periods of time, it becomes epidemic ; and, known as the " red fever," it spreads, like influenza, over vast areas. The regions of its diffusion are, in the main, tropical and subtropical.

The periodic visitations of dengue in epidemic form, the rapid diffusion of the epidemic along lines of commerce and travel, indubitable evidence, in many instances, of its transmission by means of individuals and fomites from infected neighborhoods to regions not infected, and the existence in the blood of infected persons of a micrococcus possessing unique characteristics, are facts, all of which evidence the infectious nature of dengue. The bacteriological work which resulted in the discovery and isolation of the micrococcus of dengue was prosecuted by the author during the epidemic of dengue which spread over Texas in the summer of 1885. This work, which occupied about six months, was conducted with fair results, notwithstanding the fact that the science of bacteriology was at that time in its infancy, so that it was necessary to improvise the apparatus used. Blood, obtained from about forty persons in different stages of dengue, was submitted to the following examination : (1) stained cover-glass preparations of the blood were made as it was drawn from the patient; and (2) blood was aspirated directly from a patient into a Liebig potash-bulb of the ordinary form. The end of the bulb next to the aspirator was filled with sterilized cotton, while that next to the donor's arm was closed by fusion before it was detached from the rubber tube carrying the hypodermic needle. In this way I obtained a series of glass bulbs partially filled with blood which contained only such bacteria as entered the bulbs with it. This blood was used as a culture-medium for the micro-organisms therein contained. At various

times a bulb of the series was detached and subjected to microscopic examination. These examinations showed large numbers of a unique micrococcus, which was also found, though less numerously, in the cover-glass preparations of fresh blood.

Cultures were made from freshly-drawn blood and from that contained in the bulbs. In both instances pure cultures of a micrococcus presenting new and distinctive characters were obtained. The unique feature of the cocci is the peculiar manner in which they group themselves when grown in artificial culture-media. This may be seen by reference to the accompanying photomicrographs[1] (Figs. 5 and 6).

Fig. 5.



Photomicrograph taken with 2.0 m.m. hom. imm., 1.40° apert., Zeiss apochromatic objective; and No. 6 Zeiss apochromatic projection eye-piece.

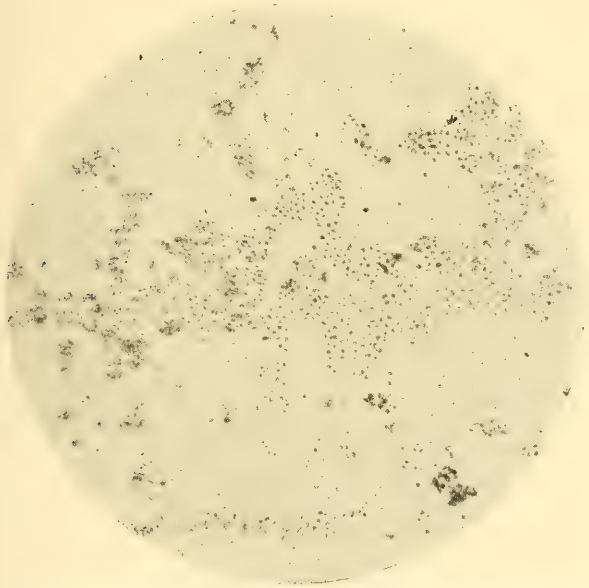
No opportunity was offered to verify the work done in 1885 until, in 1897, an epidemic of dengue appeared in Texas. Business engagements into which the author had entered about that time prevented his taking advantage of the opportunity offered. However, through the courtesy of Dr. A. J. Smith, Professor of Pathology in the University of Texas, his demonstrator, Dr. Gammon, took up the work. He succeeded in obtaining, from a person infected with dengue, a culture of a coccus presenting in general the features of

[1] Both photomicrographs, Figs. 5 and 6, were obtained from the same slide, and reproduce the streptococcus-like and filamentous growth-forms of the micrococcus of dengue.

Attention is called to the unique features of the growth-form shown in Fig. 01. The filaments are composed of numerous segments, each of which consists of numerous cocci grouped around a central larger coccus. These features are better seen with the aid of the slight magnification of a hand-glass.

that obtained in 1885. This form, however, showed no tendency to group itself into filaments; and, consequently, it occurred to Dr. Smith that perhaps this was a pus organism, and not the form found by the author in 1885. In order to demonstrate this, rabbits were inoculated subcutaneously and intravenously with the culture at various times, as much as 5 cubic centimeters of the culture being used at one time. No pyæmic symptoms resulted, but instead there was a temporary indisposition, which passed away in a few days, and the rabbits fully recovered. Unfortunately, Dr. Gammon's time became so much engaged that he was unable to prosecute the investigation further. Recognizing that my work and that of Dr. Gammon

FIG. 6.



Photomicrograph taken with 2.0 m.m. hom. imm., 1.40° apert., Zeiss apochromatic objective; and No. 6 Zeiss apochromatic projection eye-piece.

was incomplete, I sought the first opportunity offered to have our results verified and amplified. In the following spring, Dr. Smith supplied me with two tubes of the culture coccus, one of which was left with Dr. Simon Flexner, late of Johns Hopkins University, and the other with Dr. Prudden, of Columbia College. Unfortunately, these cultures were found to be impure. In a letter Dr. Flexner stated that the principal organism occurring in the culture left with him was a bacillus identical with Bacillus subtilis. It is believed that the filamentous growth-form characteristic of this organism may throw some light upon the unsolved question of the reproduction of cocci. This form was found only in old cultures and never in freshly-drawn

blood; and it is believed by the author that perhaps it represents a resting stage in the life-history of the micro-organism. As has been stated, Dr. Gammon's cultures did not show the filamentous forms, and it is supposed that this fact was probably due to the newness of his cultures.

Prophylaxis.—Individual susceptibility to the infection of dengue is almost universal, and is, in all probability, not lessened by any known drug. It has been claimed that full doses of quinine afford protection; but later and larger experience does not sustain this claim. The short duration of the period of immunity acquired from a single attack of dengue produces the belief that acquired immunity in dengue, as in diphtheria, is antitoxic, and is only effective during the time that the antitoxin is retained in the body. If such should prove to be the case, it is but a matter of time before there will be prepared a protective and curative antitoxin of dengue. At present, general or local quarantine is the only known means of prophylaxis.

Symptomatic Treatment.—Dengue varies greatly in its clinical aspects in various epidemics and in individual cases. The disease is so mild and causes so little discomfort in some instances that treatment is neither sought nor required. At other times the onset is sudden and severe, and may be marked by convulsions (especially in children), by a rapidly rising fever, or by agonizing pains and severe nervous and gastric disturbances; the patient's suffering is great and prompt relief is called for. Between these extremes cases of every grade of severity are encountered.

The complications, requiring treatment, which may arise during the course of the disease are numerous and ofttimes severe. Convulsions (in children), hypochondria, psychical disorders, hemorrhages from the gums, stomach, bowels, and uterus, jaundice, dysentery, inflammation of the lymphatic glands, abortion in pregnant women, albuminuria, catarrh of the pharyngeal, bronchial, and gastro-enteric mucous membranes, are all liable to occur during a severe attack of dengue. The convalescent period is protracted, and is characterized by great weakness, both mental and physical; and, in consequence, judicious treatment by means of tonics, analeptics, and sometimes a change of climate is required.

A dose of 2 to 3 grains of calomel, alone or with bicarbonate of sodium, followed in three or four hours by a saline purgative, such as magnesium sulphate, sodium sulphate, or sodium phosphate, if administered at the beginning of the attack, modifies the course of the disease and tends to prevent nausea and the disgusting taste of which most patients complain.

Fever.—The onset of the disease is sudden and usually without prodromata. The temperature ranges in mild cases from 101° to

103° F.; but in severe cases may go as high as 106° to 107° F. The maximum temperature is usually reached in from twenty-four to thirty-six hours. The fever is accompanied by pain in the head, eyes, back, limbs, and joints. The patient's suffering is extreme, even in cases of average intensity. The throbbing pain in the head, increased by noise or movement, and the severe pains in the limbs, muscles, and joints, which may become swollen, gave the name "breakbone fever" to this painful disease. The initial stage of dengue is usually marked by a scarlet-fever-like rash (initial rash), by gastric disturbances, nausea, and vomiting. The initial fever usually terminates in from twenty-four to thirty-six hours by lysis. There appear after an interval of one or two days the true polymorphous rash and a secondary fever of milder grade than the initial.

In cases of average severity the fever and pains (cephalalgia, myalgia, arthralgia) yield promptly to appropriate treatment. Cold applications to the head—preferably, cold water poured from a height of one to two feet, with shampooing—afford great relief. Leiter's coil or an ice-cap may be used advantageously. A hot mustard foot-bath to induce an efflux of blood from the head should be given. A tepid sponge-bath or a full bath in tepid water often affords prompt relief from neuromuscular and arthritic pains. Tincture of gelsemium, in doses sufficiently large to produce its physiological effect, is a valuable remedy in dengue; since it serves to lower the temperature, to relieve the pain, and to quiet the nervous symptoms without producing gastric disturbances. Unless contraindicated by cardiac lesions or weakness, the tincture may be given to an adult in doses of 20 to 30 minims every three or four hours until relief is obtained. The tincture of gelsemium in combination with potassium or sodium bromide has been used with excellent results in cases marked by nervous irritability—particularly, in children when convulsions are threatened. Sodium salicylate—20 grains every three hours—has given great satisfaction in affording relief from the rheumatoid pains of dengue and in reducing the temperature. I have found it most useful in those cases characterized by severe neuromuscular pains and arthralgia, with but a moderate grade of fever. A combination of caffeine, grs. 1 to 2, and sodium salicylate, 0.97 to 1.3 gms. (grs. 15 to 20), every four hours, has proved valuable in this class of cases. However, if the temperature is higher—for example, 103° to 104° F.—salipyrin, 15 grains p. r. n., will give better results. Tincture of belladonna, given to an adult in doses of 10 to 15 minims every one or two hours, is highly commended by numerous authorities as a reliever of pain. Anodyne liniments, containing chloroform, aconite, belladonna, opium, or menthol, may be applied to swollen and painful joints, although the value of such applications

has not been determined, some authors regarding them with favor and others condemning them as worthless.

Nausea and vomiting will usually yield to effervescing febrifuge mixtures, or to carbonated waters, such as liquor potassii citratis effervescens or "seltzer water," the carbonated water furnished in siphon bottles by soda-water manufacturers. Furthermore, cold applications or a mustard plaster to the epigastrium, swallowing small pieces of ice, or, in stubborn cases, morphine sulphate, by mouth or hypodermically, have been found to be of value.

In cases of ordinary severity the treatment outlined above will prove quite sufficient; but the more virulent forms, characterized by hyperpyrexia, delirium, convulsions, coma, severe gastric or gastro-enteric disturbances, etc., require more active treatment and the administration of more energetic remedies. Hyperpyrexia is not infrequent, and when associated with severe cerebral symptoms, such as delirium, stupor, or convulsions, it may become a dangerous feature of dengue. Cold or modified full baths or the cold wet pack should be resorted to if the fever does not yield to the measures already mentioned. Personally, I prefer the modified cold bath, since it does not cause the shock which so often results from plunging a feverish patient into cold water. This shock is doubtless of great value in adynamic fever, when life is threatened; since it serves to arouse the depressed vital powers of the patient and to increase his power of resisting poisonous toxalbumins. In dengue, however, these conditions do not exist; and the chief, if not sole, purpose of the bath is to reduce the temperature, which is most safely accomplished by placing the patient in water having a temperature of 90° to 95° F. and gradually reducing the temperature of the bath by adding cold water. In this way nervous shock is avoided, and one secures as good and more lasting antithermic effects than would be obtained by means of the cold bath. The cold wet pack also offers an efficient means of reducing hyperpyrexia, especially in dengue in children. Antipyrin, acetanilid, phenacetin, and particularly salipyrin are of value in the treatment of dengue, since they serve not only as antithermics, but also as analgesics.

Morphine, injected hypodermically, is the most prompt and reliable remedy for the violent pains of dengue; and it should be given in cases that do not yield to milder measures. Furthermore, it is the best remedy to use with pregnant women when abortion is threatened, a condition in which milder measures, if used to the exclusion of opium or its salts, will certainly involve a loss of valuable time, if nothing worse. Chloral hydrate and potassium bromide should be given when convulsions are threatened or occur, as frequently happens to children suffering from dengue. In this class of cases potassium

bromide and tincture of gelsemium, given in full doses, are of value; although I believe it to be unwise to rely on these remedies to the exclusion of chloral hydrate in severe cases of recurring convulsions. Chloral hydrate is the most prompt and potent remedy known for arresting convulsions in children with dengue; and should be given in doses sufficiently large to insure quiet and continuous sleep for several hours. At the same time potassium bromide and tincture of gelsemium may be given, in order to overcome nervous erethism and high temperature. The high temperature usually accompanying convulsions should be promptly reduced by the use of cold applications to the head, cold sponging, a cold wet pack, and hot mustard baths to the child's feet and legs. It goes without saying that the bowels, if constipated, should be freely opened.

Hemorrhagic cases occur in all epidemics of dengue, although they are more frequent in some than in others. The gums, the stomach, the bowels, or the uterus may be the seat of the hemorrhages—perhaps the most frequent form being metrorrhagia. Jaundice and albuminuria are commonly associated with hemorrhages in malignant types of the disease. The albuminuria, the high fever and its accompanying disproportionately slow pulse, so common in jaundiced conditions, the head-, back-, and limb-ache, and the vomiting, often black, when occurring together, as they often do, present a symptom-complex strikingly like that furnished by a malignant case of yellow fever. The termination, however, is quite different in the two diseases: in yellow fever such cases usually die, while in dengue, with proper treatment, such cases recover.

Ergot given hypodermically is perhaps the best remedy for controlling the hemorrhages. Salipyrin has also been found useful.

The jaundice is usually dependent on gastro-duodenal catarrh, and will disappear when this is relieved. This condition is generally overcome by the application of ice poultices or mustard plasters to the epigastrium. Usually the nausea and vomiting may be checked by the patient's swallowing small pieces of ice, sipping hot water, drinking carbonated waters, milk and Vichy, or milk and lime-water. Subnitrate of bismuth, cerium oxalate, or morphine may be used in more obstinate cases. The patient should be encouraged to drink water freely if his stomach will tolerate it; if not, an enema of one pint of cold water should be introduced high up in the colon every six hours. Sodium phosphate is useful in relieving constipation.

Dysentery, though not a frequent complication, becomes a serious menace at times. Acute catarrhal cases usually yield promptly to opium and Epsom salts, or to castor oil and laudanum. The more severe cases, involving the mucous membrane and lymph-glands of the colon, and characterized by large, liquid, bloody, mucoid,

foul-smelling stools, require more vigorous measures. Intestinal antiseptics, such as salol, benzo-naphthol, bismuth subnitrate and salicylate, are indicated. Opium and ipecacuanha powder may be given either with the intestinal antiseptic selected or alone. Colonic lavage, one quart of a 1 per cent. solution of tannic acid or a 3 per cent. boric acid, will be found of value in these cases.

The administration of calx sulphurata or calcium chloride may be necessary during the convalescent stage of dengue in order to reduce furunculosis and glandular enlargements. The tardy convalescence, lasting for weeks or in some cases for months, which is the rule with dengue patients, requires the judicious administration of tonics.

ACUTE TONSILLITIS, INFLUENZA, AND ACUTE ARTICULAR RHEUMATISM.

By FREDERICK A. PACKARD, M. D.

ACUTE TONSILLITIS.

The various divisions of tonsillitis, depending upon the structures mainly involved in the inflammatory process, are necessary for descriptive purposes, but have no great bearing upon the question of treatment save where the tissue involved requires some special local remedial measures. For purposes of the discussion of treatment, tonsillitis may be defined as an acute inflammation of the structures of the throat accompanied by swelling and various pathological changes in the lymph-adenoid tissues of the part and by constitutional symptoms. Except for that specific inflammation produced by the diphtheria-bacillus—and even in this form local appearances may not be characteristic—by culture alone can we distinguish between the anginas produced by various infecting micro-organisms; and, except in the case mentioned above, the method of treatment does not vary essentially in the various inflammatory processes instituted. Consequently, the treatment for angina produced by infection with the streptococcus, staphylococcus, and the diplococcus does not at the present time vary in any essential part, the virulence of the organism alone causing different degrees of inflammatory change.

When we bear in mind the abundant flora of the mouth, it is readily seen how any local weakness of the structures of the throat can readily form a nidus for the more virulent development of the organism and for the entrance of its toxins into the tissues of the body. The preventive treatment of tonsillitis is, therefore, one of extreme importance. Inasmuch as the liability to infection varies inversely with the integrity of the tissue, it is important that in those subject to tonsillitis and, in fact, in every one that the mucous membrane of the throat should be kept in as good condition as possible. Frequently repeated attacks of tonsillitis are often abruptly stopped by proper treatment of the mucous membrane of the throat or by excision of the lymph-adenoid tissue diseased, and therefore useless, or, even worse than that, actually retaining infecting agents within its substance.

In those whose mucous membranes have been damaged by pre-

vious inflammatory attacks much can be done in the way of prevention by measures adapted to increasing the power of resistance to exposure. Doubtless, many of the subjects of repeated tonsillitis have become so because of the fact that the overlying structures have been unable properly to react on exposure to cold. One of the most frequent causes for this failure of reaction is the frequent habit of keeping the throat closely invested with fur or other wrappings, the leaving off of which suddenly removes the protection previously afforded to a part whose bloodvessels have been in constant relaxation. Those who are repeated victims of tonsillitis can, so to speak, train the throat to exposure by the daily use of alternating hot and cold douchings of the front of the throat with a sponge wrung out of water. A daily cleansing of the throat by means of an atomizer with an alkaline antiseptic spray prevents the accumulation of micro-organisms in the throat and so tends not only to prevent the chronic inflammatory condition, but also to remove mechanically possible agents of disease. The follicles of the tonsil form typically good culture-areas for the growth of micro-organisms. In cases, therefore, in which the follicles tend to become filled with secretion, they should either be repeatedly emptied mechanically or, what is better, the recesses should be freely exposed by incision of the intervening walls.

As in other diseases, so in tonsillitis, it is well to consider the way in which Nature takes care of the individual attacked in order so to employ our measures as to assist the process. We can, I think, presume that the swelling of the tonsils and other lymph-adenoid tissues of the throat upon the occurrence of surface inflammation is an evidence of the activity of the glandular tissue exerting its function as a protective barrier. Doubtless, the process of phagocytosis is actively engaged in protecting the organism; while antitoxin formation can, I think, be supposed to take place. Reactive inflammation in lymph-adenoid tissue, either of the tonsils or the superficial lymphatic glands, may become excessive, while exudation of leucocytes may occur to an extent sufficient to produce their degeneration and death, and abscess-formation if the local reactive process be allowed to proceed unchecked. In many ways we can assist in curing the disease by moderating the inflammatory reaction, by removing or destroying the causative agents on the surface of the throat, and by increasing the general resisting power.

Various external applications can be employed with advantage. The use of liniments applied to the tissues of the neck is an aid in probably two ways. The friction produced by its application doubtless dilates the superficial bloodvessels and relieves the engorgement of those lying below. In addition to this, the massage incidental to the rubbing can presumably relieve some of the muscular infiltration

in the neighborhood. In mild cases the application of one layer of flannel bandage stiffened by means of pleats at three points is productive of much comfort and is sufficient external treatment. In severe cases the use of the ice-cap or poultices not only causes great relief to discomfort, but would seem to have also some more substantial beneficial effect. Which application shall be chosen depends somewhat upon the relief obtained on trial. My own preference is for the ice-cap, using either one of the long, narrow ice-bags made for this purpose or an ordinary pig's bladder. If this fails to give relief, it will almost invariably be found that a large well-made flaxseed poultice will give a very large amount of comfort.

Of local internal measures there are a large number that may be used. In the early stages of tonsillitis the painting of all of the structures of the throat with a strong solution of nitrate of silver (ʒj to fl ʒj) may abort what might be otherwise a severe attack. Ordinarily this gives rise to no discomfort and is far less painful than is the use of milder solutions. Exactly how it acts is not definitely known. It may possibly be that it has an antiseptic action alone, or its antiseptic action may be accompanied by the setting up of a simple instead of an infective inflammation, thereby limiting the entrance of the organisms. In this way it may be analogous to the methods used at the edge of a spreading erysipelas. In the later stages such an application is likely to do rather more harm than good. Our measures then may be directed to keeping the throat as clear as possible from micro-organisms and to allay to as great an extent as we can the inflammatory consequences of their presence. For this purpose sprays, by means of an atomizer, are of far more value than is the more convenient method by gargling. It has been definitely shown by conclusive experiments that solutions used in gargling reach but a short distance beyond the anterior pillars. It is possible that some of the good results seen after gargling are due to the muscular action involved in that performance and to the expulsion of material from the crypts, which has been shown by Dmochowski to take place during the act of swallowing. Of the substances used in gargling, chlorate of potassium in simple solution or combined with some such astringent as tincture of the chloride of iron, is the material most frequently employed. Where gargling has to be relied on at least in part in the local treatment of this condition, a solution of 10 grains of chlorate of potassium to the ounce of water, to which has been added listerine or glycerin, will usually be found satisfactory. I have not been in the habit of adding tincture of chloride of iron, partly because of my little faith in the efficiency of gargling and also because of its action upon the teeth and of its possibly irritating effects if used in a strength sufficient to exert any influence whatever.

The choice of a fluid for use in an atomizer varies somewhat with the local appearance. Where there is surface inflammation without evidence of special involvement of the follicles or formation of exudate, a simple alkaline cleansing solution, such as Dobell's solution or that made by dissolving Seiler's or any of the many similar tablets, is usually found efficient. Where there is much exudate or where the follicles are packed with secretion it is of advantage to combine peroxide of hydrogen with water, listerine, or similar diluent in equal parts, in order mechanically to break up the exudate by the formation of bubbles so soon as the peroxide solution touches the inflammatory product. With parenchymatous injection of carbolic acid, which was especially urged by Hofer,[1] and which has recently been advocated by quite a number of writers, I have had no experience. It would seem to me to be rather an unnecessarily radical and severe method for an affection which usually yields readily to other measures.

Where inflammatory reaction has been so intense or microbic virulence so active that pus-formation has occurred, incision of the abscess is imperatively demanded. For this purpose the assistance of a surgeon is usually unnecessary, as the operation is a simple one and easy of performance. A tenotome wrapped with adhesive plaster to within one-third of an inch of the point allows of our reaching the cavity without danger and with practically no pain. The incision is best made through the upper portion of the anterior pillar of the fauces, and more frequently strikes the collection of pus when made in that position than when made into the tissue of the tonsil itself, the peritonsillar tissue being more commonly affected in suppurating angina. Early incision in such cases is imperative, not only because of the relief afforded and also on general principles applying to abscess formation in other situations, but because of the fact that occasionally these abscesses of the tonsil and neighboring tissues have ruptured during sleep with disastrous results.

Internally the drugs that in the experience of most men have seemed to possess almost specific effect are the combinations of salicylic acid, although many recommend the use of compounds of benzoic acid. In a disease such as tonsillitis, in which the process is of a nature capable of rapid subsidence, it is difficult to determine the exact part played by our remedies; yet to my mind there is no doubt that the salicylates do not only relieve the pain in the extremities and back which so frequently accompanies tonsillitis, but that they also have a favorable action upon the local trouble. This is seen not only when the salicylate is used in solution, so that it might possibly act locally upon the mucous membrane, but also when it is given in capsules. My own preference is for the salicylate of strontium,

[1] *Deutsches Arch. f. klin. Med.*, Bd. lvii., Hefte 5 und 6, S. 578.

administered in 5-grain doses in capsules and repeated every two or three hours. Sodium salicylate given in solution (preferably with some essence of pepsin as an adjuvant and diluent) can be given in doses of 10 grains every second or third hour. When the systemic depression is not particularly marked, yet the muscle- and joint-pains are quite intense, it is of advantage to combine with the salicylate some member of the coal-tar series with analgesic properties. Owing to the intense depression produced by the toxins manufactured in tonsillitis, it is important to remember the depressing effect of these coal-tar products unless they are used with caution and in small doses. Of the coal-tar products, phenacetine seems to have the least depressing effect combined with the greatest power for relieving pain, and it will be frequently noted that a dose of $2\frac{1}{2}$ grains will relieve almost as well as does a dose three or four times as large. The only coal-tar product comparable to it in regard to its absence of marked depressing effect is lactophenine, but the pain-lessening properties of this drug seem to be less marked than are those of phenacetine. Chlorate of potassium has been long used in this disease, and possesses undoubted value. Given by the mouth, it is excreted in the saliva and exerts its beneficial effect in this disease just as it does so markedly when used to combat stomatitis in children. A dose of 5 grains in solution every three or four hours is sufficient. When given in the form of tablet it is slowly dissolved in the mouth with probably more local effect than when given internally, owing to the repeated acts of swallowing of smaller quantities of the drug dissolved in the saliva. It is especially of value in the milder cases without marked submucous involvement.

The use of quinine in tonsillitis, as in many other diseases, is probably a relic of the times when the beneficial action of that drug in combating malaria was first discovered. When quinine was found to control the fever of malaria, it was naturally thought that it should be used in an effort to control the fever in other conditions. We now know that quinine controls the periodic fever produced by the plasmodium by a specific toxic action upon the etiological factor. While quinine can control temperature due to many other causes, it is doubtful whether its antipyretic effect is of any value in this disease, in which the fever is simply an outward and visible sign of the action of the micro-organisms and never reaches a point sufficiently high or exists for a sufficient time to make it necessary or advisable to control it. If we give quinine as a bitter tonic, it would be well to save it until it could be of more value during the stage of convalescence. It is also to be remembered that quinine has a harmful effect upon the ear, an organ that is frequently damaged by this disease itself, owing to extension of inflammation through the Eustachian tube.

The tincture of the chloride of iron is found in many formulæ advised for use in this disease. It may be that the theory that this drug has some inhibiting action upon septic processes is true, yet proof of it is entirely lacking, and it is indeed difficult to see in what way it could have such an action. If the drug does not do good, its capacity for harm should make us hesitate to use it. It locks up secretion and impairs digestion, often hindering the taking of sufficient nourishment.

The convalescence from tonsillitis is marked chiefly by the extreme prostration after the subsidence of all local appearances. Its treatment differs in no way from that necessary in similar conditions due to other causes. Careful regulation of the amount of exertion made is of considerable importance. Tonic treatment is always necessary, especially in view of the fact that almost no disease, except acute articular rheumatism, is capable of so rapidly diminishing the number of red blood-cells. Some such combination as the following will usually be found of value:

℞. Acid. arsenosi, gr. $\frac{1}{100}$;
Strychninæ sulph., gr. $\frac{1}{30}$;
Ferri reduct., gr. j.—M.
Make into one pill to be taken after meals.

While the vast majority of cases of tonsillitis pass through their course without complications, there is no case so slight that care should not be taken to discover any complications that may arise. The occurrence of endocarditis, pericarditis, pleurisy, nephritis, or thrombosis requires the same measures of relief as when these conditions occur under other circumstances.

The important point in the after-treatment of tonsillitis is the insuring of absolute cure of local conditions and the restoration of the mucous membrane and tonsils to their proper condition after each attack. Only in this way can repetitions occurring with increasing frequency be avoided.

The question of the contagiousness of an individual case of tonsillitis can only be determined by culture, and then not positively unless the Klebs-Loeffler bacillus be found. The infectious origin of the disease and the fact that it may be caused by a variety of organisms make it important to prevent communication from the sick to the well. It is a good rule in every case to give some instructions in regard to the danger of communication, which by careful explanation do not excite undue alarm. In this way the occurrence of a series of cases may be avoided. The patient should occupy a separate bed, and precaution should be taken to avoid direct transmission

from the throat, as by kissing. House epidemics of tonsillitis are a matter of common experience, while lately de Rochmont has reported a quite extensive hospital epidemic. This report shows that while tonsillitis is ordinarily a mild infection, it can occasionally be productive of serious complication, a fact that still further makes it necessary to obviate the contracting of the disease wherever possible by isolation. Disinfection after the attack is over is, as a rule, unnecessary, unless the infection has been by the diphtheria-bacillus; but it would seem advisable as soon as practicable to remove the patient from the room where he has been ill, in order that thorough ventilation may be procured and the vitiated atmosphere may be inhaled no longer than necessary by the patient.

The diet in tonsillitis has to be modified because of two conditions, the presence of fever and of inflammation of the throat. The former usually regulates itself, as the patient's absolute repugnance toward any kind of food usually requires that all nourishment should be given in the simplest forms. In spite of this absence of desire for food, the patient should be urged to take an amount of nourishment sufficient to maintain strength. The obstruction to and pain on swallowing necessitate the use of liquid or soft foods and those of an unirritating character. On this account milk forms probably one of the best articles and should be given at frequent intervals, about every three hours, in quantities of six or eight ounces. Junket (or slip) forms a rather pleasing variation from the absolute milk-diet, which unfortunately is repugnant to many. Broths can be used, but unless carefully made are of doubtful nutritive value, and any excess of seasoning has to be avoided because of the danger of local irritation on swallowing. Cool liquids are usually preferred, one of the most pleasing of which, beside those mentioned, being clam-juice. It seems to have some nutritive value and is refreshing partly because of its saline taste. Cracked ice should be swallowed freely because of its being agreeable to the patient and probably of advantage as a local measure of treatment.

INFLUENZA.

THE treatment of influenza is one of extreme importance at the present time, not only because of the frequent epidemics of this disease that are occurring in all parts of the civilized world, but also because upon its proper treatment depends much of the future health of the patient. We must especially bear in mind that we are dealing with a specific infectious disease produced by an organism (the bacillus

of Pfeiffer) capable of manufacturing toxins which not only possess the greatest depressing power, but which also seem in some way, whether by lowering the vitality alone or by some peculiar action, to open the way for infection of the tissues by other micro-organisms.

The problem of prevention is one extremely difficult to solve. The virus seems to be disseminated so freely and to pass natural or artificial obstacles with such ease that isolation seems futile. The exact source of contagion is almost impossible to trace in individual cases, and it would seem as though contagion from personal contact was exceptional, and that almost always the disease arose from general atmospheric saturation by the poison. The only preventive measure that we can adopt is the increasing of the resisting power to the greatest possible extent. It is possible that an attack may occasionally be averted by toning up the system in cases of lowered vitality. It is well on the occurrence of an epidemic or the likelihood of its appearance to pay particular attention to the building up of those enfeebled by illness. Whether we can so increase the resisting power as to avoid an attack matters little, inasmuch as this increase of strength will find the patient in better condition to resist the inroads of this disease should he be attacked.

Of all measures employed in the treatment of influenza, there is none that equals in importance or is so indispensable as is absolute rest. From the beginning of the disease the patient should be in bed, and should be kept there until all of the active manifestations of the illness have ceased. In those of feeble vitality, not only rest in bed, but absolute avoidance of even slight efforts should be enforced.

The diet during the acute stage can be regulated by the capacity of the individual to take and assimilate food. The more nourishment of a nutritious kind that can be taken and utilized the less will be the depression caused by the disease. The taking of a sufficient supply of nourishment should be insisted upon, and it is preferable to furnish it in the most readily assimilable and concentrated form. For this purpose milk, junket, beef-juice, clam-juice, and egg-custards should be given at frequent intervals.

Owing to the depression of resisting power and to the peculiar tendency of influenza to render the tissues susceptible to secondary infections, it is important that thorough ventilation of the sick-room should receive careful attention. In addition to this, care should be taken that further depression should not occur by chilling of the surface. While the production of sweating is not of particular advantage, the patient should be carefully covered with blankets sufficient to avoid any possible exposure to change of temperature. Of course, the importance of this is greater in elderly people and in those of feeble vitality.

External applications in the form of heat are of much value in relieving the aching pains which are so prominent a feature of the disease in the early stages. Friction with liniments does but little good, owing to the sensitiveness which prevents their use with any degree of vigor. Ordinarily, the hot-water bag will furnish a sufficient degree of heat to render bearable the pains in the extremities. A higher degree of temperature can readily be furnished by the use of hot bricks or, what seems to act better than anything else, a bag of salt which has been placed in the oven for a time sufficient to insure the thorough heating of its whole thickness. Whether the salt has any virtue save as a good radiator of heat it is difficult to say. Patients repeatedly affirm that the heat from the salt bag gives more relief than does the same amount of warmth from any other body.

With a disease having a short course of no determinate length it is difficult to estimate properly the relative value of various forms of drug treatment. The universal experience points, however, to the value of the salicylates in treating this disease. It is necessary to remember in giving this or other drugs that the tendency to depression is so marked a feature of the disease that we should be careful to do nothing that can possibly add to it. The depressing effect of the disease on the heart, witnessed even in mild attacks, makes it necessary to bear in mind that the salicylates all have to a greater or less degree the power of cardiac depression. The same may be said of the coal-tar products, whose use in influenza is very extensive. Unfortunately, there is no class of remedies which so quickly relieves the discomfort and pains of this disease as do the last-named drugs. Their use, however, always requires caution and should be avoided unless their employment is almost essential. Small doses of phenacetine, lactophenine, or acetanilid may be employed if necessary; but their use should be discontinued at the earliest possible time, and their effects should be watched with care. It will usually be found that some such combination as the following can be used without injury and with a decided measure of relief:

℞. Phenacetin, gr. iiss;
Strontii salicylat., gr. v.—M.
Make into one capsule and take one such every three hours.

As soon as the acute symptoms have subsided and pains have ceased it is well to stop at once the coal-tar product and institute tonic measures.

A drug that has certainly some beneficial action in influenza is the salicylate of cinchonidia, which can be given in doses of 2 grains

every three or four hours during the acute stage of the disease. It seems to be but little depressing, to have some effect upon the pains, to rather shorten the course of the disease, and to have none of the disadvantages of quinine. The frequent occurrence of otitis media after influenza makes the use of quinine one not without danger of producing trouble. In the doses mentioned above, cinchonidia would seem to be devoid of this danger as it is but seldom, and only in susceptible persons, that tinnitus or other disagreeable effects are noticed after its use. One of the advantages which this drug has is its ready combination in pill or capsule with strychnia, and the formula—

℞. Strychninæ sulphat., gr. $\frac{1}{48}$;
Cinchonidinæ salicylat., gr. ij.—M.
One pill (or capsule) every four hours.

will usually be found quite satisfactory. The danger of using strychnia early in the course of the disease is the same as that attached to the employment of stimulants, that is to say, the patient is given a false feeling of strength, which sometimes causes him either to rebel against enforced rest or actually to disobey instructions. This, however, can usually be obviated by proper directions.

Upon the subsidence of the acute symptoms a tonic treatment should be at once instituted before the patient is allowed to make any but the smallest efforts. With the restriction mentioned above, stimulants in the form of brandy or whiskey punches are usually of value or even essential. From the beginning of convalescence our efforts should be to nourish the patient to the highest point attainable with proper assimilation. The resumption of effort should always be kept a little behind the increase in strength, and it is important that each step should be preceded by careful testing. Doubtless, in most cases the long-continued effects of an attack of influenza are due not to the severity of the disease or to the occurrence of complications, but to lack of care or of obedience during the stage of convalescence. One of the most valuable remedies we have during this stage is strychnia, and in uncomplicated cases it is the drug upon which most reliance may be placed. The danger of exertion beyond the actual strength of the patient when taking strychnia has been mentioned above.

Even long after convalescence has been completed care is necessary to avoid chilling and other causes of secondary infection. It would seem that the influenza bacillus left in its train the same susceptibility to infection that is present during the course of the attack. In this, probably more than in any other disease, change of air, if

but for a brief time, is capable of preventing much in the way of future illness; and this is true even after mild attacks. Unless bronchial or pulmonary complications have been present, the air of the seashore acts beneficially. If bronchitis is marked or if the lung itself has suffered, the seashore usually does not agree. In that case a change to country air is usually of much advantage.

In no disease do we get such a variety of symptoms as is seen in influenza. It is, therefore, important to mention the variations in treatment necessitated by some of the special manifestations.

One of the systems most frequently attacked is the respiratory. During the past winter the epidemic of influenza has been characterized rather by the coryza, conjunctivitis and inflammation of the upper respiratory region than by the more generally systemic symptoms. The coryza is of such severity that it usually requires local treatment, particularly as sinus involvement is very frequent. Relief of the nasal obstruction is our best preventive for the occurrence of irritation of the remainder of the respiratory tract, as undoubtedly the mouth-breathing necessitated by the closure of the nares is responsible for much of the bronchial catarrh and irritative cough seen in these cases. Sometimes the use of a simple cleansing spray, such as Dobell's solution, will be sufficient to keep the passage open and allow the free discharge of secretion. At times it is necessary to use some protective powder, of which the following formula, recommended by Seiler, has proved of much service:

℞. Morphinæ acetat.,
Cocain. hydrochlorat., *āā* gr. ½;
Pulv. acaciæ, dr. ½;
Bismuth. subnitrat., dr. iiiss.—M.

This can be used freely, and will afford considerable relief. Where cleansing solutions of simple composition and some such snuff as that spoken of above fail to give relief, it may be necessary to cause contraction of the hyperæmic, swollen mucous membrane by local applications by the swab. For temporary relief, weak solutions of cocaine and antipyrine, of witch-hazel, and suprarenal extract may be used. The disadvantage of cocaine is that while it produces the greatest possible relief immediately upon its application, the mucous membrane seems to become more congested and swollen after its use. It has the advantage, however, of sometimes enabling us to open the calibre of the nose, permitting us to cleanse thoroughly by the use of a spray the deeper parts of the nasal chambers.

Laryngitis and tracheitis, so frequently seen in the course of influenza, are best relieved by the use of the croup-kettle or an improvised

substitute. The beneficial action of the steam from the croup-kettle can be much increased by the addition of compound tincture of benzoin to the fluid evaporated or to the steam. In the former case it should be added in the proportion of about a drachm to the pint. The relief afforded by this measure is often surprising, and is obtained at far less cost than if we employed internal medication for the same purpose. Where the bronchi are involved the same measure may be employed; but we usually need in addition expectorants given by way of the stomach. The expectoration in these cases is usually scanty and the cough out of proportion to any material to be removed; consequently, we can use in these cases sedative expectorants with less hesitation than in cases of bronchitis of other causation. For this purpose, one of the best remedies that we have is the newly introduced diacetic ester of morphine, known as heroin. This would seem to act as a prompt sedative to unnecessary cough, while it would seem also to be lacking the disagreeable qualities inherent to many of the other opium preparations. In doses of $\frac{1}{20}$ to $\frac{1}{12}$ of a grain, every two or three hours, it will often be found effectually to quiet the unnecessary cough which so frequently disturbs rest and is so annoying to influenza patients. It may be conveniently combined with terpene hydrate in the form of a tablet triturate, the latter drug being used in doses of $2\frac{1}{2}$ to 3 grains. Where physical signs indicating swelling and marked inflammation of the bronchial mucous membrane are present, one of the ammonia preparations will usually be required. Apparently, it makes but little difference which one of these we select, but in my own experience ammonium chloride with compound liquorice mixture gives the most satisfactory results. Its chief disadvantage is interference with digestion.

External applications are of value in the bronchitis of influenza upon the same principles as they are employed in the bronchitis of other cause. The tight substernal pain especially noticeable in the early stages will usually be promptly relieved by the application of a turpentine stupe to the front of the chest every fourth hour. As soon as expectoration becomes free and the sensation of oppression is lessened, the rubbing of the chest (back, front, and at the sides) with equal parts of turpentine or amber oil with sweet oil, will usually suffice. Especially in children and in the aged, the wearing of a cotton jacket or a thick undershirt is advisable in the hope that their employment may prevent the increase of the bronchitis and the development of bronchopneumonia. In the later stages of the bronchitis the oil of eucalyptus, of sandal-wood, or of gaultheria will hasten complete cure.

Pneumonia, which is such a frequent complication of influenza both during the active stage and for a short period after convalescence

has apparently been established, must be treated upon the ordinary principles used in the treatment of that disease when occurring independently of influenza. It is, however, important to bear in mind the fact that in influenza, and often in times of an epidemic of influenza even in individuals not infected by the systemic disease, pneumonia is apt to assume a very asthenic type, and, therefore, requires a more stimulating line of treatment than that employed at ordinary times. While in frank croupous pneumonia we can frequently do without cardiac stimulation, in the pneumonia of influenza this is necessary almost from the start. The influenza toxin has such a marked depressing effect upon the circulation that free cardiac stimulation must usually be employed to overcome the load added by the pulmonary complication. The choice of a stimulant that shall be used must be determined for each individual case. Of alcoholic stimulants, brandy or whiskey is ordinarily the best; where, however, the digestion is impaired, as is not infrequently the case, a good Madeira or dry champagne may have a better action. Of cardiac tonics, we may choose between digitalis and strophanthus, bearing in mind the vaso-motor constrictor action of these drugs. To obviate this disadvantage, it is well to combine them with small doses of nitroglycerin, which, while stimulating the heart, overcomes peripheral resistance by its vaso-dilating action. Strychnia is invaluable as a cardiac tonic in the pneumonia of influenza, and has the advantage of being at the same time a good nervous and respiratory stimulant. Among other drugs that may be required in the pneumonia of influenza are caffeine and spartein. These, however, are usually reserved for the cases in which there is also evidence of renal insufficiency. A valuable agent in the treatment of the pneumonia of influenza is the inhalation of oxygen gas. Either the charged flexible rubber bag or the more convenient apparatus kept in the shops at the present time may be used for this purpose. An important point is the method of administration of the gas. As sometimes applied, it could seem capable of doing but little except causing the patient annoyance. Our object in employing it is to, so to speak, supersaturate the air with oxygen. To do this, it is unnecessary either to have the patient wear a mask, covering the nose and mouth and tending to interfere more or less with the free expansion of the lungs, or to insert the nozzle of the apparatus either in the nostrils or in the mouth. This method of applying it is usually extremely annoying to the patient, and the use of oxygen by this method usually has to be abandoned. Probably, just as good results are obtained by holding the nozzle so that the current of oxygen shall not impinge directly upon the patient's face, and yet shall pass sufficiently near the nose and mouth to be freely inhaled. By holding the nozzle at

the level of the ear and pointing it forward we can give the patient marked relief from distress, cause cyanosis to lessen or disappear, and frequently quiet instead of disturb our patient. Recently Clement Penrose has advocated a method of using oxygen in pneumonia which would seem to be even better than that advocated. By the use of warm water in the reservoir attached to the cylinder, the current of oxygen gas is made less perceptible to the patient and the use of a funnel in the inhaling-tube allows of the diffusing of the gas through the air in the neighborhood of the patient's mouth and nose without his being rendered uncomfortable by the strong forcible current present when the apparatus is employed in the ordinary manner.

During the convalescence from pneumonia occurring in the course of or due to influenza there is even more necessity for care in regard to the circulation than is the case after pneumonia occurring independently of this disease. The best rule to guide us in allowing our patient to make exertion is that no effort should be made until by experiment it has been found that lesser efforts fail to cause cardiac embarrassment. By care in this particular, sudden cardiac failure can be almost invariably prevented.

The disorders of the digestive tract which are so frequent in some of the epidemics of influenza, and which are especially seen in children, require treatment differing in no way from the same disturbances due to other causes. The only point that needs to be borne in mind is the necessity for the administration of sufficient quantities of nourishment to counteract to some extent the depressing effects of the primary disease. The same might be said of the renal complication occasionally seen as the result of infection by the influenza bacillus.

Of great importance in the treatment of influenza is the care of the circulation. This disease more than any other would seem to be the immediate cause of myocardial degeneration. Possibly one reason for this is the fact that it is one of the few infections which are of frequent occurrence after the middle period of life; and in addition to this the influenza poison has a marked disturbing effect upon the nervous apparatus of the circulation, using the term circulation in its broadest sense as including not only the heart, but also the bloodvessel-system. The latter effect of the poison is seen in the old as well as in the young, in the strong as well as in the feeble. It is important, therefore, even in the mildest attack of this disease so to direct our treatment that not only shall no artificial aid be given to this depressing action of the poison, but also that the whole treatment of the case shall be so ordered as to obviate to as great an extent as possible present or future troubles of the circulatory system. It is for this

reason that the coal-tar products are to be used with the greatest caution in treating patients with this disease. In all cases of influenza it is well at the earliest practicable moment to employ some form of cardiac medication. Undoubtedly the best drug for this purpose is strychnia, which has other advantages, making its early employment advantageous. Where cardiac degeneration is already present, and where there is marked peripheral resistance or arterial degeneration, the combination of nitroglycerin with strychnia will be of decided advantage. Even in cases in which regurgitation at the mitral orifice occurs this combination will usually be found better than the use of digitalis or strophanthus, inasmuch as the regurgitation but rarely indicates valvulitis, usually being due to myocardial changes and consequent dilatation. It would be a safe rule to make, that the younger the patient the more we should turn to these latter drugs; the older the patient the less prone we should be to use them in influenza and its consequences. After the acute illness is passed there is often left a decided lack of pneumogastric control. In these cases digitalis often acts promptly and efficiently. If tried and proved to be not promptly successful, its use should be immediately abandoned. Where there is evidence of general lack of nervous balance, shown by tachycardia, the bromides will usually be found to act beneficially. The depressing effect of these salts must, however, be borne in mind and their action carefully watched. Where there is evidence of tachycardia having an organic origin, as from either myocarditis or myocardial degeneration, their use will be productive of more harm than good. In order to determine the question of their use, it is well to consider the age of the patient, the condition of the peripheral circulation and of the bloodvessel-walls, with the presence or absence of physical signs of cardiac dilatation. At times, cases of tachycardia following influenza will yield to nothing but absolute rest for a greater or less period of time. In these cases drugs would seem to have practically no influence except as adjuvants to other measures. The slow heart of influenza and following that disease is but little amenable to treatment. In combating it we have to be guided by our estimate of the condition of the heart and blood-vessel-walls, using our measures always with the care not to do harm. It is very possible that in increasing the pulse-rate by the use of drugs we are working in opposition to Nature and inflicting injury upon the damaged circulation. The inefficacy of most drugs in obviating this condition should make us lend our efforts rather to improving the general health and nutrition of the patient, in the hope that by these measures proper cardiac action will be restored.

Next to the circulatory apparatus the nervous system seems most to feel the brunt of influenza. As with the former so with the latter

system, it is important during convalescence so to regulate exertion that acquisition of nervous force shall keep a little ahead of its expenditure. Where this cannot be attained, the patient is frequently left with so little nervous energy that the only means of restoring him to health is by resort to the formal rest cure. A discussion of this would be out of place here; but I would simply state that there is no measure capable of taking its place in post-influenza nervous exhaustion, just as I think it may be safely said that there is no disease so capable of producing illnesses remediable by that method of treatment. Less degrees of rest are often requisite before complete recovery from the disease can be considered as secured. In many, an ocean voyage or a change of air and scene of other kind may be necessary to complete a cure. Cases of more active nervous disturbance following influenza are to be treated as would the same conditions occurring independently of that disease. The mental disorders due to influenza seem, however, to be far more amenable to home treatment; and, as the outlook is favorable as a general rule, sanitarium or, particularly, asylum treatment should only be employed when absolutely necessary.

Anæmia following influenza requires treatment by abundant fresh air and sunlight and good, nourishing food. The drugs of most value in its treatment and those tending to improve the general nutrition are arsenic and iron. In young people especially one of the combinations of peptonate of iron with manganese is found to be of decided value. Change of air to the mountains or seashore would seem, however, to do more to stimulate the blood-forming organs than any drugs that we possess. In children especially a course of cod-liver oil following the attack will hasten a perfect recovery of health. In adults, fortunately, this drug is not so frequently of importance in obtaining a complete cure.

ACUTE ARTICULAR RHEUMATISM.

Before discussing the question of treatment of acute articular rheumatism, a few words regarding the nature of the disease as viewed in the light of recent researches are necessary, especially as they bear upon the question of prophylaxis. It is impossible at the present time to look upon acute articular rheumatism as a disease of the apparatus of locomotion. The involvement of the joints is evidently but a part of the disease, and that not one of the most important. Of the many theories to account for the cause of acute articular rheumatism, none so satisfactorily fills all the requirements as that

recently very strongly advocated as to its being an acute infectious process. It would be out of place in the present article to bring forward the various arguments that have been advanced for and against this theory of the etiology of the disease. Suffice it to say that there is rapidly accumulating more and more convincing evidence as to the correctness of the view. An acute infection can best be combated by prevention. It may be that at some time the bacillus of Achalme will be found to be the true cause of the disease; or possibly Triboulet's micro-organism may be discovered to be the sole etiological factor. In regard to neither of these organisms do we know sufficient of the life-history to be of any aid in the preventive treatment. The same can be said should the view especially advocated by Singer as to the *rôle* of weakened pus-organisms be found to be correct, save in so far as cleanliness and asepsis may be concerned. In the absence of means for checking the growth or abolishing the possible micro-organismal cause, our efforts must at present be bent toward preventing access of the supposed organism to the tissues of the body.

While the influence of season cannot be denied in the production of acute articular rheumatism, it is probable that changes in the surrounding media act only in a general way by depressing the vitality or by in some way increasing the ease with which the poison enters the system. The latter view would seem the more rational.

For many years those subject to attacks of acute articular rheumatism have found advantage from the use of woollen garments worn next to the skin. The use of this preventive measure is too long established for us to cast it lightly aside; nor does the more recently advocated view of the infectious origin of rheumatism make it seem unlikely that this measure is one of value. In the vast majority of cases of rheumatism there are found symptoms or signs pointing to disease of various structures in the throat. In many cases of acute articular rheumatism the patient volunteers the statement that one of the early symptoms has been pain in swallowing. It is probable, therefore, that the protection of the surface by woollen garments acts as a preventive by warding off chilling of the surface, congestion of the mucous membrane, lowering of vitality, and infection of the most easily vulnerable mucous membrane, namely, that of the throat.

In dealing with the question of the treatment of rheumatism it is necessary to bear in mind the difference between frank acute disease and the various joint-inflammations of subacute or chronic occurrences which are misleadingly spoken of as rheumatic. This question is of particular importance regarding the necessity for change of climate as a preventive measure for rheumatism. While there are many facts showing the absence of acute articular rheumatism from

dry climates with porous soil, it seems hardly justifiable to send to such climate a patient who has simply had one attack of acute articular rheumatism. Of course, where possibly because of this attack, the joints are left in a condition susceptible to inflammatory trouble from change of temperature and from meteoric conditions, the question of change of residence may be one of importance. In the prophylaxis of acute articular rheumatism, change of climate enters but little, as there are many cases of this disease in which one solitary attack occurs and passes away leaving no trace and may not be followed by a repetition. Where repeated attacks of acute articular rheumatism occur change of climate may be absolutely essential, because in no other way can we prevent the entrance of infecting agents into the system. It is, however, in this as in all cases a measure that should only be advised when all other attempts at prevention have been exhausted, as there are few who can adopt it without more or less sacrifice.

There are in our possession at the present time a sufficient number of facts, as has been stated above, to warrant us in believing that the throat is a frequent portal of entry for the rheumatic poison. Under preventive treatment, therefore, should be considered the measures by which the throat can be rendered as nearly normal as possible by local application to the mucous membrane, by removal of adenoid or other growths capable of retaining in their recesses various micro-organisms or holding in their substance the same bodies in a condition of activity. The same would hold good to a less degree in regard to the mucous membrane of the nasal cavities. Careful treatment of the throat and nose to render them as nearly normal as possible, together with such measures as we can employ to prevent recurrence of throat affections, would seem to be an important point in the preventive treatment of acute articular rheumatism. The throat and nose, however, are not the only avenues by which infection can occur. Lesions of the skin and of other mucous membranes are probably capable of admitting the infection. These, therefore, should be corrected, not only on general principles, but because they are possible portals for the rheumatic poison. It is possible that change in climate, as well as the wearing of woollen garments, may be of benefit in the prevention of rheumatism through the power of these measures to lessen superficial inflammation. Careful attention to surface lesions, such as eczema, may prevent attacks by shutting off a portal of entry, the long-recognized association of chronic skin troubles with articular inflammation being best explained by looking upon the former as the portal of entry of agents capable of originating or perpetuating the latter.

The patient with acute articular rheumatism should be put to bed

and kept there until not only the joint-pains have left, but until, as will be mentioned later, there is complete absence of evidence of active lesion of any of the serous membranes.

Owing to the pain produced by pressure, it is usually necessary to raise the bed-clothing from the patient by means of some such device as the cradle that is employed in the treatment of fractures. In using this or similar appliances, it is important that the surface should be protected by some light covering in more immediate contact with the body. For this purpose, a small shawl or other light woollen covering should be used. Owing to the free sweating, surface chill is apt to occur unless some such precaution is taken, and we may have the original disease complicated by some entirely avoidable catarrhal trouble, or a primary catarrhal inflammation re-excited.

The diet in acute articular rheumatism has to be regulated, in the first place, by the digestive capacity of the individual, which usually admits of the administration of only the simplest forms of nourishment, such as milk and various milk foods. The avoidance of starchy food has for a long time been advocated, primarily because of the belief that acute articular rheumatism is due to the presence within the body of an excess of lactic acid. It is now definitely proved that this view of the causation of the disease is erroneous. Nevertheless, there is present within the body in this disease an excess of that acid, the cause for that excess being not definitely known. What part this may play in producing symptoms in what might be called a secondary manner, we do not definitely know. It would seem wise, in view of past experience in regard to the administration of these articles and in view of the excess of lactic acid present within the body, to avoid the administration of articles supposed to increase this formation, especially as the excessive formation of lactic acid seems to have no conservative function. There is no evident reason why the nitrogenous materials should be eliminated from the diet, inasmuch as there is no connection between this disease and those due to irregularity in nitrogen metabolism, such as is present in gout, with which disease this has been long wrongfully associated, apparently merely because in both the joints are involved. In view of the intense anæmia which rheumatism can produce in a remarkably short time, it is advisable, so soon as the digestive organs can stand it, to administer foods tending to increase the amount of hæmoglobin in the blood. For this purpose red meats and beef-juice should be employed early. Occasionally it will be found that for some unknown reason patients convalescing from acute articular rheumatism have some return of the joint-pains upon giving these articles of diet, just as we find that there are certain cases of anæmia following acute articular rheumatism in which iron cannot be admin-

istered in medicinal form because of the same effect. Of course, in such cases these articles should be withdrawn.

Various external applications are of value in diminishing the amount of pain in the joints attacked in this disease. In estimating their value, it is important to bear in mind the fact that without evident cause and without warning swelling, heat, redness, and pain will leave one joint and attack another. Undoubtedly the protection of the joint from contact with cool bedding is of value in relieving the joint-pains. For this purpose, carded wool, raw cotton, or flannel bandages are of value, the latter being more difficult to apply without increasing the pain than are the two former applications. Lead-water and laudanum on patent lint and surrounded by an impervious covering, such as oiled silk, gutta-percha tissue, or waxed paper, seems oftentimes to give great relief, although it is rather doubtful whether the drugs used are of most value or whether the relief produced is not caused by the material used in holding it and preventing loss of heat. Recently oil of gaultheria has been much used as a local application to the joints, either pure or mixed with equal parts of olive oil. After a moderate trial of this method, I have been unable to satisfy myself that there was any specific effect produced by the oil, although the question is one which is rather difficult to decide for the reasons spoken of above. Various local applications have recently been advocated for use in the form of ointments and oily applications. Many of these have various combinations of the salicin group as one of their ingredients, such as, for example, one recommended by Ruel, composed of salicylic acid (3 to 10 per cent.), absolute alcohol (33 per cent.), and castor oil (40 to 50 per cent.). It is said of this, as of some other similar preparations, that after their application salicyluric acid rapidly appears in the urine. Whether any of the salicylic acid so administered by the skin penetrates directly into and favorably affects the joint-cavity or the synovial membrane has not been proved, and it is difficult to imagine any of the material penetrating so deeply directly through the overlying tissues. Its rapid appearance in the urine would, in fact, argue for its being rapidly taken up by the lymphatics and poured into the general circulation rather than prove any local action upon the subjacent articular structures. Apparently such applications do no harm; but whether they are capable of any better result than is one of the ordinary protective coverings employed cannot be considered as proved.

Bloodletting, which used to be so freely and injuriously employed in the treatment of acute articular rheumatism, has, of course, been long since discarded, as also have the various other lowering measures which were formerly in vogue.

The giving of a mercurial purge in the form of a 5-grain powder of calomel or a 5-grain blue-pill is a rational preliminary measure, as it clears out the digestive tract, acts as a cholagogue, has some diuretic action, tends to clear the tongue, and seems to have the same beneficial effect in this disease as it has when so given at the outset of typhoid fever, pneumonia, and many other acute illnesses.

But two systematic methods of treatment by drugs need to be mentioned at the present time. Among the large list of remedies that have been used, such as colchicum, guaiacum, veratrum viride, mercurials, and lemon-juice, none has survived as a routine measure of treatment. In 1852 appeared the first edition of Fuller's work on *Rheumatism, Rheumatic Gout, and Sciatica.* To this author more than to any other we owe the extensive employment of alkaline treatment, which for many years held absolute sway in the treatment of acute articular rheumatism. The use of alkalies in this disease was suggested by the acid sweats which form so prominent a feature of it, and by the ready clotting of blood withdrawn from the arm in the days of venesection. Fuller's explanation of their virtue is divided into four headings: first, the action of alkalies and their salts as restorers of the alkaline condition of the system; secondly, their assisting in the maintenance of solubility of the fibrin; thirdly, their ability to calm the action of the heart and arteries; and, fourthly, by increasing the metamorphosis of tissue, increasing the elimination of urine and of pathological materials. We now know in regard to the first of these supposed properties that the blood is never acid in acute articular rheumatism, no matter what plan of treatment is adopted; and, indeed, that an acid condition of the blood is inconceivable. In regard to the second reason, it is impossible either to deny or affirm that alkalies or any other materials given by the mouth maintain the solubility of fibrin. The third reason has somewhat more plausibility, alkalies acting as sedatives to the circulation probably because of their action as diaphoretics and diuretics, which results in the elimination of waste material and consequent diminution of vascular tension. The fourth reason for their action—that is, the increase of the metamorphosis of tissue—has no firm foundation. According to present views, tissue-metamorphosis is increased rather than diminished in rheumatism. The alkalies may, however, cause the elimination of waste materials. The form advised by Fuller for their administration is that of an effervescing draught containing 40 to 60 grains of the bicarbonate of potassium or sodium with a drachm or more of the acetate of potassium, and in strong individuals with the addition of 10 or 15 minims of wine of colchicum. Where constipation is present he advised the use of potassio-tartrate of sodium instead of the potassium salt. This was repeated at intervals of two,

three, or four hours for the first twelve to twenty-four hours of the attack, the intervals between the doses being diminished as the symptoms subsided.

A simplification of this method has continued in use by many up to the present time. Ordinarily the bicarbonate, the citrate, and the acetate of potassium alone or in various combination are given in doses of 15 to 30 grains every three or four hours. By some this method is still employed to the exclusion of every other. It has now been, it would seem, quite definitely proved that the duration of the attack of acute articular rheumatism and the liability of complications are not materially influenced by the alkaline treatment. If that is the case, it can be asserted that the alkalies do not do good, while it cannot be denied that their capacity for harm is a feature that must be taken into consideration. In a disease such as acute articular rheumatism, in which the poison, whatever its nature may be, is capable of impoverishing the blood to probably a greater extent than any other disease of like severity, it is important to avoid any measures which are capable of increasing the natural tendency of the disease. Alkalies undoubtedly are capable of producing this effect, and unless we have more definite proof of their value than is at present at hand we should hesitate to employ them.

The treatment of large series of cases by mint-water or other measures without more apparent efficacy seems to show that the duration of the disease could not be considered as influenced by treatment up to the year 1876. In that year Maclagan introduced to the profession the salicyl compounds as remedies for acute articular rheumatism. Since that time salicin, salicylic acid, the various salicylates and combinations of the latter have been used very extensively. It would seem to make but little difference which of the salicyl compounds is employed, as they all seem to act in the same manner. An interesting series of observations made by Gaglio seem to prove that sodium salicylate rapidly extravasates into the serous cavities. Whether this is explanatory of the action of the salicylates cannot be assumed with certainty. It is, however, an interesting observation. Oil of gaultheria is used by some in doses of 10 drops. Inasmuch as it probably depends for its virtue entirely upon the contained methyl salicylate, it seems more rational to give a simpler form of the salicylic element.

Salicin is extracted from the bark of various species of willow, and occurs as a white, crystalline material sparingly soluble in water and of peculiar taste. Salicylic acid occurs in needle-shaped crystals, and is sparingly soluble in cold, but very soluble in hot water. It is derived from oil of wintergreen by boiling with caustic potash or by

the action of caustic soda upon carbolic acid. Salicin can be given in doses of from 15 to 30 grains every two or three hours. Salicylic acid can be given in doses of about 10 grains every four hours, although larger doses are sometimes employed. The salicyl compounds are usually given in the form of salicylates of one of the alkalies, sodium, ammonium, or strontium. These are ordinarily given in doses of from 15 to 20 grains every three or four hours until marked evidence of their systemic action is obtained. They are best given in solution, if soluble, but in the case of the strontium salt they have to be administered in capsule. The symptoms arising from their excessive administration need never be allowed to exceed a proper grade. The earliest manifestation of their systemic effect is ringing in the ears resembling that produced by quinine. Beyond this point it is never necessary to administer the drug. One other congener of these drugs should be mentioned, namely, salol. The only advantage to be derived from the use of salol in acute articular rheumatism is presumably due to the presence of salicylic acid. When we consider that the combination of carbolic acid and salicylic acid is broken up by contact with the pancreatic juice, and that 36 per cent. of carbolic acid is capable of absorption for every 64 per cent. of salicylic acid, it can readily be seen that we are introducing into the body a considerable amount of material capable of producing harm, and not claimed to be of value in the treatment of the disease. It is recommended by some to use this drug in doses of $\frac{1}{2}$ drachm three times daily. It would seem that it would be better to employ a simpler remedy capable of more directly accomplishing the same end. A large number of preparations have been suggested as succedanea or alternates of the salicyl compounds. Among these might be mentioned salophen, and the more lately introduced aspirin. About the latter drug we know practically nothing definite. From the few reports at hand little can be gathered as to its composition or physiological action, while the results would seem to be no better than those that could be shown after the use of the older and better known remedies. It can, I think, be said that none of the more recently introduced pharmaceutical products have any advantage over salicin, salicylic acid, or the salicylates.

It has been claimed that the salicyl compounds act as specifics in the treatment of rheumatism in a way analogous to the action of quinine in malaria. Exactly how it acts we do not know. In spite of an overwhelming mass of testimony as to its efficacy in this disease, there are still some who cling to the alkaline treatment; some who believe that mint-water is as good as any other drug; and some who actually claim that the salicylates not only have no specific action, but that they have no favorable effect whatever upon the cardiac

complications, and that relapses are more frequent after their use than after other methods. The question is one that is extremely difficult to solve by the statistical methods. Impressions must to some extent take the place of figures. My own impression would correspond with that of, I believe, the majority of observers, that the salicyl compounds have a specific action, not only in ameliorating pain, but also in shortening the duration of the disease, lessening its severity, and thereby tending to avoid the occurrence of complications on the side of the heart. Seldom do we see now a case of acute articular rheumatism lasting for from ten days up to three or four weeks or two months. Ordinarily in a few days after the administration of the salicylates in efficient dose the temperature falls, the pain becomes easier, and the general condition of the patient rapidly improves. It can be frequently observed that following too early stopping of the drug before the articular symptoms have entirely subsided and the temperature reached the normal point, fresh articular involvement will occur with a return of the other symptoms. Usually the duration of an acute attack of articular rheumatism lasts no longer than from a week to ten days. This is certainly less than is seen when the disease is untreated or when combated with mint-water, or even with alkalies. If these statements are true, therefore, we must look upon the salicylates as specific remedies.

In regard to the occurrence of cardiac complications, it is extremely difficult to furnish definite proof. Our standard as to what constitutes valid evidence of cardiac damage are too variable to permit of much result from comparisons of statistics compiled by different observers ; and even those furnished by one observer are difficult to interpret, particularly because the majority of any large group of cases occur in hospital practice, making it impossible to follow them for a time sufficient to determine the future course of the cardiac condition. My own impression is that under the use of the salicylates the heart is less seldom involved to an extent capable of demonstration to the ear than would seem to be the case under other plans of treatment.

If the salicylates are capable of causing subsidence of pain and fall of temperature, they may, so far as the heart is concerned, actually tend to the production of cardiac trouble. The heart is probably damaged to a greater or less extent in every case of acute articular rheumatism of any severity. Lesions of the cardiac muscle or of its lining would naturally be expected not to subside at once under any form of treatment. It would, therefore, be a disadvantage, so far as the heart complications go, to produce too rapidly such a condition that the patient could make exertion and thereby overexcite or strain the damaged organ. It is very possible that in

this way cardiac complications may be more frequent under the use of salicylates than under other forms of treatment which less rapidly cause such amelioration of the symptoms that the patient can make exertion and thereby increase the heart's action. I believe it is an important point in the treatment of acute articular rheumatism with the salicyl compounds to bear in mind the danger of cardiac damage, even though physical signs be negative, and to keep the patient absolutely at rest for at least a week after the temperature has reached the normal point; and that the resumption of effort should be made cautiously and with careful testing of each advance upon the heart's action and sounds. As to the danger of relapses following the use of salicylates, I have been able to find no figures that are convincing. Here, again, the early relief of severe symptoms may possibly be accountable for frequent relapses. Too early stopping of the use of the drug will undoubtedly allow of a relighting of the disease. It is well, therefore, to continue the salicylates in half doses for at least a week after the acute symptoms have disappeared.

Much has been said about the depressing action of salicylates upon the heart and the need for caution in their administration on this account. Their careless use is, of course, to be deprecated for this and other reasons; but, save in the very grave cases of rheumatism that are marked by adynamic symptoms, cardiac depression would not seem to be greatly feared. It is doubtful whether the specific effect of the poison upon the heart would be at all intensified by lowering of the activity of that organ; in fact, the reverse would seem to be the case.

In any case of rheumatism, there is danger of a curious condition arising which is generally characterized by extreme elevation of the temperature and the occurrence of cerebral symptoms. Whether the salicylate treatment has diminished the frequency of this accident or not, cannot be definitely settled; although it would seem that at the present time these cases are occurring, or possibly only being reported, with less frequency than in the past. The treatment of this condition consists in the lowering of the temperature, by the use of external cold, in the form of the ice-cap, the cool bath, or the cold bath. These measures should be employed with perseverance until the temperature is reduced; nor is the presence of other complications of sufficient importance to cause us to withhold them or cease in their application.

One of our chief aims in treating acute articular rheumatism is the prevention of cardiac complications. It would seem that the general principle, that whatever shortens the course and lessens the severity of the disease, should favorably influence this tendency. Aside from these measures, there is little that can be done at the onset of

cardiac mischief save that we be cautious in allowing any effort to be made which could increase cardiac activity, and so presumably increase intracardiac pressure and keep up or intensify inflammatory damage to the endocardium of the valve leaflets. In 1896 Richard Caton published in the *British Medical Journal* the account of a method employed by him for the prevention of endocarditis. A series of small blisters were applied along the course of the third, fourth, and fifth intercostal nerves in front and at the sides of the chest. These were applied one at a time as soon as softening of the first sound at the apex occurred. The author mentioned claims that by this method liability of endocarditis is decreased. Such may be the case, but it is noticeable that his patients remained, on an average, forty-one days in the hospital, most of which time was spent in bed. It is a question whether the rest in bed for a prolonged period of time was not responsible for at least a great part of his favorable showing.

Where endocarditis is present to an extent sufficient to give rise to physical signs the treatment advocated varies somewhat. Some apply flaxseed poultices to the precordium; some counter-irritation in the form of mustard, some in the form of stupes; while many employ blisters over the heart. Each method has its advocates, and a just estimate of the value of the individual procedures is difficult. More recently the use of the ice-cap over the precordium has been advocated. After a quite extensive use of both the latter and some of the former methods, I have come to depend entirely upon the application of cold, either in the form of the ice-cap or, what I prefer, a Leiter's coil. Undoubtedly, this application is capable of diminishing frequency of the pulse, and, in the cases in which they are present, lessening the intensity of cardiac symptoms. As to the ultimate result of the use of these remedies no definite statement can be made, as it is impossible to estimate the severity of the cardiac affection and its capacity for injury in any individual case. Where endocarditis has occurred, as manifested by physical signs, it is especially important that the patient should maintain absolute rest on the back until there is absence of all evidence of increasing cardiac trouble, and even after this exertion should keep within the limit of causing cardiac signs or symptoms. It is far better to err on the side of keeping the patient a prisoner in bed or in the chair longer than necessary, rather than to err upon the other side. It is especially important to remember that the cardiac lesions tend to increase in severity rather than to diminish, and that permanent organic change, otherwise capable of prevention, may be induced by too early effort.

Where there is distinct evidence of involvement of the endo-

cardium our line of procedure must be guided by the indications afforded by the cardiac action and by the condition of the general circulation. Where there is no clear indication for medication addressed particularly to the heart, it is wiser to withhold our cardiac remedies. The mechanism of control of the circulation is quite perfect if unmolested, so that careful consideration will usually show some physiological reason for deviations from the normal cardiac action. It is a mistake, therefore, to look upon rapid pulse as an indication for remedies increasing pneumogastric control, as digitalis, for example. The drug may, if given wrongfully, actually interfere with Nature's attempt to lessen the inflammatory damage, as the increased force of the systole and excess of vaso-constriction can be readily seen to cause increased violence of valvular closure, although the pulse-rate may be lowered. Where cardiac action is apparently excessive, due to toxins or metabolic products, or other causes not residing primarily in the endocardium, it is proper and advisable to give small doses of tincture of aconite or veratrum viride (the choice depending upon the condition of vascular tension), or, what often acts better, very small doses of morphine at frequent intervals. Where the heart's action is failing, as is especially seen in the adynamic cases with endocarditis, alcoholic stimulants or ammonia may be necessary to keep the organ going with sufficient activity to maintain life, even at the risk of increasing valvular mischief. Where necessary, the more vigorous cardiac tonics, such as digitalis, strophanthus, spartein, or caffein, may be used, even at the risk of increasing the endocardial damage; but they should only be employed when necessary.

After the storm is over and the endocardium is left thickened, infiltrated, and possibly distorted, the question is different. It has been for a long time thought, and probably with good reason, in spite of absence of direct proof, that the iodides are capable of causing absorption of simple inflammatory as well as syphilitic infiltrations. It is well, therefore, to employ small doses of one of the iodides for at least some weeks after the subsidence of the acute attack, in the hope that we may thus lessen the progress of tissue formation with subsequent contraction in the infiltrated areas, or possibly cause more rapid absorption of the infiltrate. The use of small blisters over the precordium, with the idea of accomplishing the same end, has been too long advocated by good clinical observers to be lightly cast aside because of absence of demonstrable proof of their efficacy. They probably do exert some beneficial influence over the underlying structures in spite of our inability to explain their action; and, as they cannot possibly do harm or interfere with methods of cure instituted by the economy, they should be employed.

The treatment of the damaged heart needs most careful judgment, for the reason that in many cases the damage is best compensated by changes in the wall of the chamber most affected by the lesion. Many cases, especially in the young, need no artificial aid in compensating the defect save correction of existing conditions of malnutrition and improving the general health to the greatest possible degree. This process of compensation can be unduly accelerated or made excessive by injudicious medication, and here again our best judgment has to be exercised to avoid interfering with a process proceeding well without our assistance.

Pericarditis calls for no especial treatment except for the measure indicated as applicable to inflammation of the endocardium. The ice-bag or counter-irritation over the precordium, care in the use and selection of drugs having cardiac action, and the use of the iodides after the acute stage has passed are of value in this as well as in the endocardial complication. The peculiar delirium seen especially in cases of rheumatism complicated by pericarditis will be mentioned later. The occurrence of excessive serous effusion in the pericardium calls for paracentesis as in the same condition from causes other than this disease. The question as to the continuance of the salicylates after the occurrence of endocarditis or pericarditis has been raised. If our ideas are correct regarding the specific action of the salicylates, the occurrence of either or both of these complications should call for a continuance or return to their employment. While the salicylates may depress vascular tension or lower cardiac activity, it is doubtful whether they do so to any harmful extent, and, even so, this action can be readily counteracted by the judicious use of alcoholic or other stimulants. The only evident disadvantage of cardiac sedation might be in cases of rapid dilatation in pericarditis with tendency to permanent enlargement from that cause. Most of the cardiac phenomena of acute articular rheumatism are those of irritation and excitation, conditions not at any rate increased by the salicylates.

Sleeplessness may be so marked as to require treatment. Where sufficient to counterbalance the disadvantages of sedatives the latter should be employed with care. If the loss of sleep is due to intensity of the pain, morphine should be given in doses sufficient to insure a good night's rest. The hypodermic injection of $\frac{1}{6}$ to $\frac{1}{4}$ grain will be most effectual, and seems to lock up the secretions less than when the drug is given by other channels. Where the sweating is excessive it is well for this and other reasons of more general applicability to combine it with a small dose of atropine. Where pain is not sufficient of itself to prevent sleep the wakefulness can be obviated at a less cost by the use of one or two 10-grain doses of trional.

Delirium, which is a prominent feature in many of the hyper-

pyretic cases and in those complicated by pericarditis, is best controlled by the use of hyoscine hydrobromate in doses of $\frac{1}{120}$ to $\frac{1}{100}$ of a grain, given hypodermically. In the hyperpyretic cases the use of hydrotherapeutic measures will usually suffice to quiet delirium at the same time that it controls excessive temperature. In milder cases a gentle rubbing with warmed alcohol will act as an efficient sedative. Where, as is sometimes the case, hyoscine seems to have no quieting effect, the bromides may be required, although the disadvantages attaching to their use are greater than is the case with hyoscine. Where other measures fail morphine should be unhesitatingly used, if the delirium is sufficiently violent to endanger the heart.

The adynamic condition seen in some cases of rheumatism must be treated on principles differing in no way from those required in similar conditions of other causation. Stimulants and nourishing food are usually the chief requisites.

In the management of convalescence from rheumatism the condition of the heart requires first thought. This has been mentioned above. There is one other danger of the convalescent stage requiring mention, viz., that of embolism from the thrombi on the recently inflamed areas. The occurrence of embolism shortly after rheumatism is remarkably rare in consideration of the conditions present. It is, however a danger to be apprehended. The only safe rule to follow in order to avoid its occurrence is to forbid all effort or excitement so long as there is evidence of active or progressive cardiac damage. It is important, therefore, to keep the patient quiet and bed-fast during this time; and (an apparently minor but really important point) to keep the bowels freely moving, by diet and drugs, in order to avoid straining efforts at stool.

The anæmia following rheumatism is almost always of sufficient intensity to require medicinal treatment. The correction of anæmia is probably of importance in repairing cardiac damage and avoiding some of its results. The two most valuable drugs for this purpose are iron and arsenic, given best in combination in some such way as the following:

℞. Liquor potassii arsenitis, fʒj;
Syrup. ferri iodi, fʒix.—M.
Sig. 10 to 20 drops in water, gradually increasing up to 20 or 30 drops, according to the age.

Or,

℞. Acid. arsenosi, gr. $\frac{1}{4}$;
Ferri reduct., gr. xxv.—M.
Ft. pil, No. xxv.
Sig. One after meals.

There is no doubt that, while the joints usually return to the normal condition after an attack of frank acute articular rheumatism, there is increased susceptibility to damage in joints so affected. Avoidance of exposure for a year or two after recovery is, therefore, to be ordered. It is well for the patient to wear silk or woollen underclothing during the winter following an attack, in order to avoid the effects of sudden changes of temperature. Where articular symptoms persist, whether due to secondary or succeeding infection, a change to a dry climate for a year or two may be necessary.

The treatment of the sequelæ of rheumatism falls naturally under other heads, and needs no further mention here. It should, however, be remembered that the results of rheumatism affecting the heart tend to persist and to progress for long periods after the articular and general manifestations have disappeared; and that while the patient may present but slight or no signs of cardiac damage during or immediately after the attack, progressively increasing thickening, distortion, and shortening of the valve leaflets and chordæ tendineæ may in time lead to physical signs capable of detection by examination, of symptoms causing much distress, and of lesions which may shorten life. Repeated examinations of the heart for months after the attack can alone enable us to feel reasonably sure of the absence of cardiac damage and insure the proper direction of hygiene and medicinal measures in preventing further damage and assisting efforts at compensation.

DIPHTHERIA.

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THE problem of the prevention and treatment of diphtheria has been greatly simplified during the past decade. The exciting cause of the disease is a germ whose life-history and peculiarities of growth are well understood. A distinction is now drawn between true diphtheria and pseudo-diphtheria. The former is caused by the Klebs-Loeffler bacillus. It is usually a primary disease, but may occur as a complication of other infectious diseases. Pseudo-diphtheria is commonly secondary to one of the infectious diseases, and is caused by germs other than the Klebs-Loeffler bacillus, chiefly streptococci and staphylococci. In septic diphtheria there is a mixed infection, the Klebs-Loeffler bacillus being accompanied by streptococci or other septic germs.

Prophylaxis.—Diphtheria is to a large degree a preventable disease. The first and most important measure of prevention is isolation. Not only should the child be isolated who is known to have the disease, but also the one who has been exposed. In the case of the latter, quarantine should be maintained for at least five days. After disappearance of the membrane the period of quarantine differs greatly with different cases. It should be enforced as long as bacilli are found in the throat. Park, of New York, has investigated this subject in 1736 cases. In but 3 per cent. did the bacilli disappear during the first week after the disappearance of the pseudo-membrane. In one-third of the cases they had disappeared at the end of the second week, and in two-thirds at the end of the third week. In the remaining cases they were present for a period ranging between thirty and ninety days. In some cases, bacilli which thus persist lose their virulence. This, however, is by no means constant, and the fact cannot be determined without animal experimentation. It is taking an unjustifiable risk to allow a child in whose throat bacilli are found to mingle with other children. When it is impossible to determine the question by cultures the period of quarantine after disappearance of the membrane should not be less than three weeks. The disappearance of the germs may be hastened by the use of mild antiseptics. For this purpose a warm saturated solution of boracic

acid may be used, or dilute Seiler's solution, or a bichloride solution (1 : 10,000). The latter is rendered less irritating by the addition of borax and glycerine, as in the following formula:

℞. Hydrargyri chloridi corrosivi, gr. ¾;
Sodii boratis, ʒij;
Glycerini, ʒij;
Aquæ, q. s. ad Oj.—M.
S.—For gargle or throat wash.

The importance of a daily examination of school-children cannot be overestimated. The number who are found to have mild tonsillar diphtheria is alone ample justification for the trouble and expense. In the year 1898 these examinations in the schools of New York City resulted in the exclusion of 133 children having diphtheria, not to speak of 32 with scarlet fever, 253 with measles, 276 with pertussis, and 1627 with contagious eye diseases. The question of closing schools in the case of an epidemic of diphtheria must be decided differently in different communities. In the country and in small towns where the children will be separated, closure may be a measure of prevention. In large cities, particularly in tenement regions, the children will not be thus separated, but will play together continually. The opportunities for exposure will be almost as great, while the valuable measure of school inspection will be lost.

Suspected cases should be at once isolated and, if possible, a culture should be taken. Without a culture no skill can always distinguish between a diphtheritic and a non-diphtheritic throat. Even cases of follicular tonsillitis are in rare instances diphtheritic in character. When diphtheria is prevailing, particular caution should be exercised and every suspicious case should be isolated until its character can be positively determined.

The room selected for the diphtheria case should be the one that can be the most perfectly isolated and can at the same time be made comfortable for the attendants. In city houses this is usually on the top floor. No child should be allowed to come onto that floor. The conventional wet sheet before the door has some advantages in preventing the circulation of air when the door is opened. The vaporizing of antiseptics is useless, for no antiseptic can be thus rendered of sufficient strength to kill bacilli in the air. The measures most potent in preventing the infection of others is absolute cleanliness and the immediate destruction or removal of all secretion from the throat and nose. Pieces of soft cloth should be used instead of handkerchiefs, and should be burned at once or dropped into a solution of bichloride (1 : 1000). Pieces of membrane and mucus should be

treated in the same manner. All soiled clothing should be placed in water and immediately boiled, or should be kept in a bichloride solution until boiling is possible. Dishes and porcelain vessels should be washed in a 1 : 20 carbolic solution. A weak carbolic solution should be kept in a basin for frequent washing of the hands of the nurse. If the floor is bare, it should be washed daily in a 1 : 3000 solution of bichloride. If carpeted, the carpet should be brushed over daily with cloths wet with the same solution. No food should be allowed to stand in the room. Milk has a particular power of absorption, not only of odors but also of bacteria floating in the air. An effective solution for the disinfection of linen and clothing has been advised for many years by boards of health, and is as follows: zinc sulphate, 4 ounces; common salt, 2 ounces; water, 1 gallon.

At the termination of the disease all toys and books should be destroyed. Books are particularly dangerous, for they cannot be disinfected. The room should be washed—floor, walls, and ceiling—with a 1 : 1000 bichloride solution. Furniture should be thoroughly washed in the same solution. Carpets and upholstery should be disinfected with steam. The room should then be thoroughly fumigated. Fumigation by sulphur, as it is ordinarily done, is ineffective. It is more effective when the air is charged with moisture. It is wise, therefore, to dampen the various objects in the room and to cause steam to be generated during the time of fumigation. Three pounds are necessary for each 1000 cubic feet of air space. Formaldehyde is unquestionably superior to sulphur for room disinfection. Apparatus can now be obtained at not large expense which will satisfactorily disinfect rooms of ordinary size. Of the commercial solution 10 ounces should be used for each 1000 cubic feet.

In every house where there are children, it is wise to furnish one room as a sick-room. The floor should be of hard wood and the walls and ceilings should be covered with washable paper. The furniture should be of plain wood or white enamel, without carving or deep grooves. There should be no upholstered furniture nor permanent hangings. Such a room can be made as cheerful and useful in time of health as any in the house, and will simplify greatly the question of disinfection in case of illness.

The nurse is more liable to contract the disease than any other person, and should, therefore, receive more attention than she usually does. She should be instructed to disinfect the hands frequently, and to change the outer dress often, using one that can be easily washed. She contracts the disease commonly through germs carried into the mouth by the hands or food. If possible, therefore, she should have a room adjoining the sick-room in which to eat and sleep. She should use a mild throat wash several times a day, and at the outset

of the attack she should receive an immunizing dose of antitoxin of at least 400 units. When possible, there should be a second person to act as intermediary in the household. This person may perform various offices outside the sick-room, but should not come in close contact with the other children of the family.

The attending physician should use every precaution against disseminating the disease. He should have several gowns made of rubber or muslin, fastened closely about the neck and wrists and reaching to the feet. One of these gowns should be used in visiting every case of diphtheria or scarlet fever. It should be removed on leaving the room and the hands, face, and head should be disinfected. Pieces of membrane coughed from the throat during the examination and bacilli which have lodged upon the furniture will thus not be carried to other children. A stethoscope should be used to examine the chest and the tongue-depressor should not be taken from the room. In examining the throat the physician can readily learn to stand at the side of the patient and thus avoid contamination if the child coughs. The physician's visits should not be longer than necessary, and he should not himself carry out the details of treatment unless he believes it to be a strict necessity.

The establishing of hospitals in large towns for diphtheria and scarlet fever is a measure of the greatest public importance. They should contain not only provision for the poor, who are usually unable to carry out strict isolation, but also rooms for those who are able and willing to pay for treatment. Many well-to-do people are at times so situated that they cannot properly isolate these diseases. For people stopping in hotels and boarding-houses, they often prove a boon whose value can hardly be estimated.

A healthy throat is one of the most potent safeguards against diphtheria. Germs are practically seeds which require a soil for their development. Adenoid growths and spongy tonsils form a soil upon which the germs of diphtheria especially flourish. Hence, their removal is a preventive measure of the greatest importance.

Immunizing by antitoxin is a most valuable measure of prevention. There has been much discussion regarding its power to produce immunity, but observations in hospitals on large numbers of children leave no doubt upon this question. Morrill has recently reported results in the Children's Hospital of Boston, where 1808 patients have received immunizing doses. He concludes that immunity, no matter how thorough the exposure to diphtheria, may be conferred for at least ten days by the injection of a small dose of serum (100 to 250 units), provided it is given twenty-four hours previous to actual infection. A larger dose (250 units for a child of two years up to 500 units for one of eight) will confer safety for

twenty days under similar conditions. Immunizing doses are now given as a routine measure in most children's hospitals. The dose for immunizing purposes ranges from 50 units for an infant of three months up to 300 or 500 units for older children. The most experienced inspectors of the New York Board of Health advise not less than 300 units.

Treatment.—The management of the sick-room has already been referred to in considering prophylaxis. When several children are ill in the same family, if possible not more than two should be placed in the same room. It is better that each child should be alone during the acute stages, for children often become nervous in watching the progress of the disease in each other. Each patient should have at least 1200 cubic feet of air space, while 2000 cubic feet are better. Rest in bed should be insisted upon even in mild attacks. At the slightest symptom of cardiac weakness it should be enforced with increased strictness. During the acute stage of severe cases, when there is cardiac weakness, the child should not be allowed to raise the head from the pillow even for syringing the nose, and should never be lifted into the sitting posture.

The feeding of diphtheria patients is often difficult. This results not only from soreness of the throat, but often from complete anorexia. Milk is the best diet. It should be given frequently in small quantities, diluted with lime water. If the patient is an infant, the milk mixture should be made weaker than that given in health. Beef-juice, mutton broth, or thin gruels may also be employed. If there is indigestion or vomiting, the milk may be peptonized. In the late stages, particularly in septic cases, when the importance of maintaining the nourishment is particularly great, the child often refuses food absolutely. Rectal feeding with fully peptonized milk may be attempted. It is, however, usually unsatisfactory in children. Gavage may be resorted to as the only means of saving the child. Breast-fed infants should be fed with milk drawn by the breast-pump, which saves the child the labor of nursing and avoids the possibility of infecting the mother. Adults should be kept upon a diet of beef-juice, broths, eggs, and milk.

In few conditions are stimulants more clearly indicated than in many cases of diphtheria. Their use, however, requires great judgment, and they should not be given simply because the child has that disease; but it is a grave error to withhold them too long. It is better to begin too early than too late, for it is difficult to overcome the depressing effect of the diphtheria poison after it is fully established. Alcohol is the most effective stimulant in diphtheria, and whiskey is usually the most available preparation. It should be given diluted in seven or eight parts of water at intervals ranging

from two to four hours. The daily amount administered is the safest guide to dosage; the quantity being used should always be known. At five years one ounce per day may be all that is required, but many times this amount may be indicated. It is impossible to state the dose with any degree of certainty. It must be determined in each case by the symptoms and by the effect it produces. After alcohol, strychnia must be placed as the most valuable stimulant. It may be given in doses of $\frac{1}{200}$ grain every four hours to a child of two years. Ammonia, camphor, strophanthus, and digitalis are useful at times. The latter is indicated when the pulse is of low tension and the heart's action is rapid and weak. The fluid extract is the best preparation for children, of which 1 minim may be given every four hours at four years.

Of the many drugs used in diphtheria ten years ago but few are to-day indicated. The internal administration of bichloride of mercury and calomel fumigations has been superseded by antitoxin in the practice of most men. They were formerly much used, as they were believed by many to be the most efficacious treatment available. The bichloride was given in large doses, $\frac{1}{60}$ grain hourly for young babies being advised by Jacobi. It should be administered in water, largely diluted. The administration of full doses of tincture of iron is undoubtedly helpful, both for its local and constitutional action. A serious objection to its use is its deleterious effects upon the teeth, which cannot be prevented in young children. The following is an available method of administration:

℞. Tinct. ferri chloridi, ℥ij;
Glycerini, ℥ss;
Aquæ, q. s. ad ℥iij.—M.
S. A teaspoonful every two hours to a child of three years.

These drugs may be given in severe cases and when antitoxin has been given late or is unavailable. Special symptoms must be treated as they arise, but there is no drug to be relied upon as having any controlling power over the disease.

Forcible removal of the membrane is not justifiable; neither is the use of caustics and acids. The direct application of powerful antiseptics to the pseudo-membrane was tried, but they were found powerless to destroy the bacilli in the deeper layers. The danger of serious accidents is always great in making such applications to the throats of children. The use of trypsin and other digestive agents also proved unsatisfactory. Swabbing of the throat frequently caused abrasion of the mucous membrane, so that extension of the pseudo-membrane could be seen following the course of the swab.

In short, harsh and vigorous local treatment had been abandoned by most practitioners of large experience long before the introduction of antitoxin. Local treatment now consists in the use of soothing and bland washes or mild antiseptics. Among these, normal salt solution, Seiler's solution, and saturated solution of boracic acid are the most commonly employed. The object of modern local treatment is cleanliness, for it has been abundantly demonstrated that the pseudo-membrane cannot be disinfected by local applications. Sprays are totally ineffective. Unless the mouth of the child be forced open and the tongue be depressed, the spray does not reach the seat of the disease. The fountain or bulb syringe is the most effective means of cleansing the throat. The child is turned upon the side and the pipe of the syringe is placed between the back teeth and the warm solution is gently thrown into the back of the throat. The throat may be reached even more effectively through the nose. For this purpose the child is turned upon the side and the head is held at the edge of the bed. A bag syringe is filled with warm solution and placed a little above the child's head. The nozzle is inserted into the uppermost nostril and the solution is allowed to flow gently. It returns through the mouth and the other nostril, cleansing thoroughly the throat and naso-pharynx. A skilful nurse will carry out either of these measures without causing the child disturbance. A mother can be readily taught to do the same. In ordinary cases this irrigation is to be done but a few times each day. In grave septic cases it may be done every three hours. Peroxide of hydrogen is capable of doing great harm. By irritating the mucous membrane, it may aid the extension of the pseudo-membrane. It often causes the formation of a thin membranous deposit which may be mistaken for diphtheritic membrane, and will last as long as the treatment is continued. It should not be used in the nose in a strength greater than 1 : 12, and in the throat of 1 : 8. It should not be combined with other drugs, but should be simply diluted with water, lime-water, and glycerine. The lime-water counteracts the acid reaction, and renders the solution less irritating. Such a solution, however, is unstable, and should be made fresh every day.

It should never be forgotten that weakness of the heart is one of the gravest symptoms of diphtheria. Three of the most important factors of treatment—rest, stimulants, and nourishment—are designed to prevent exhaustion and heart-failure. Any measure, therefore, which causes apprehension, excitement, and physical struggles may far more than counteract any good it may accomplish. In pharyngeal diphtheria many excellent practitioners content themselves, therefore, with simply administrating the solutions designed for local effect in teaspoonful doses every half hour or oftener.

Antitoxin Treatment.

A prolonged discussion upon the value of antitoxin treatment in diphtheria is not required, because that question has passed from the realm of discussion and uncertainty into that of certainty. It is quite true that there are a few physicians who think the subject still surrounded by doubt, and refrain from using a therapeutic agent whose claim to confidence has been incontestably established. In a recent article in the *British Medical Journal* the belief of the great majority of competent medical observers is thus aptly stated: "The list of drugs in the Pharmacopœia is long. For all, it is claimed that they are of value in the treatment of one and the other of the ills to which our flesh is heir. Yet few of even the most useful have been subjected to the same fierce criticism as has the antitoxin of diphtheria, and still fewer have borne the ordeal as triumphantly."

The history of the antitoxin treatment and the methods adopted in preparing the serum have been so frequently discussed during the past five years that they require but brief mention in this place. The history of antitoxin may be said to date back to 1860, when Pasteur first experimented upon ferments. Since that time a long line of investigators have one by one added to the stock of knowledge, which has finally resulted in effective treatment. The last of this illustrious line were Behring in Germany and Roux in France. The antitoxin treatment may be said to date from the year 1894 and in the United States from early in 1895.

Antitoxin is obtained from the blood-serum of a horse which has been repeatedly injected with doses of toxin of increasing strength. Under such treatment antitoxin gradually forms in the blood. When it has reached the highest possible point the horse is bled into sterilized vessels. The blood is allowed to clot and the serum is drawn off under the strictest antiseptic precautions. It is put up for use in vials or hermetically sealed bulbs. Of the latter the two forms here illustrated (Fig. 01) are the most largely used. They are highly

Fig. 7.

Showing the two forms of aseptic antitoxin bulbs in most common use.

satisfactory, as they prevent all contamination by extraneous germs. Either bulb is used by breaking the stem at a point indicated by a file mark. The serum can then be emptied into the open syringe or drawn up through the needle.

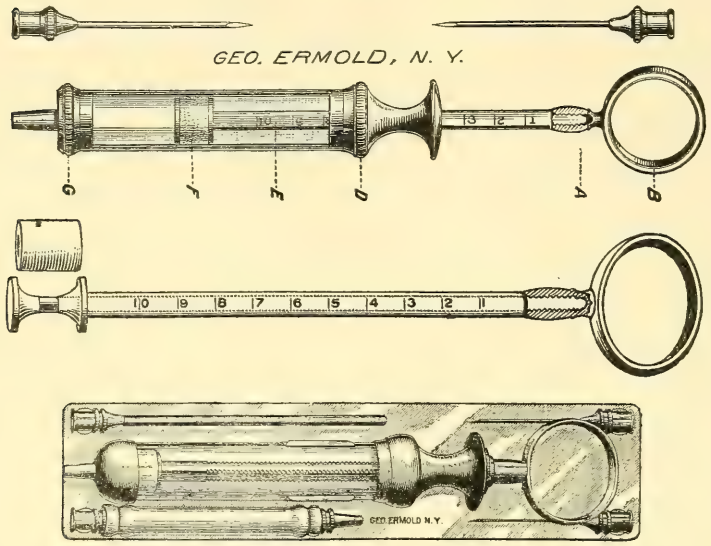
The blood-serum acts simply as a vehicle for the antitoxin. Efforts to isolate the antitoxin have not yet been successful, although progress has been made in that direction. Dried serum has not proved as satisfactory as the ordinary form. The greatest efforts have been made to produce a serum rich in antitoxin, for it has been believed that a part, perhaps all, of the objectionable symptoms were due to the serum rather than to the antitoxin. A smaller size of dose was also desirable. In the earlier serum each cubic centimetre contained but 100 antitoxin units, but the strength was gradually increased to 500 units. More recently antitoxin containing 800 units to the cubic centimetre, and even more, has been produced. The expense of production increases rapidly with the increase in potency.

The hypodermic method is the most satisfactory mode of administration, and will probably continue to be so. Numerous reports have been made showing favorable results in administration by the mouth. Such method cannot, however, be as exact and certain as the hypodermic. When exact medication is so imperative it is unwise to resort to inexact means. With the weaker serum the administration was a rather serious matter, owing to the large amount of fluid to be injected. With the recent potent serums the injection is much simplified. A syringe should be used that can be disinfected by boiling. Such an instrument can now be obtained from many makers. It should have asbestos packing to permit of sterilization. If sterilized immediately before using, or if simply placed in water, the packing will be made sufficiently tight. Syringes with rubber packing are now being made satisfactorily. A small syringe is to be preferred to a large one because of the greater certainty of excluding air-bubbles. One holding 5 cubic centimetres is sufficiently large. The needles should be of steel of the ordinary hypodermic type, but they should not be of too small calibre. The serum is viscid, and does not flow as easily as water. If the needle is small it will flow back past the piston, unless the packing be in the most perfect condition. Most syringes are furnished now with a blunt "last drop" needle to facilitate drawing the serum from the bulb. Many physicians attach the needle to the syringe by means of a rubber tube to prevent breaking, should the child struggle. This is less necessary with the high potency serum, the dose of which is comparatively small.

The site of the injection should be washed with soap and a strong carbolic solution. The needle should be boiled immediately before using, and the syringe, if it has not been very recently boiled, should be rinsed with alcohol. The puncture should be closed with collodion. The side of the abdomen or chest is the most available site for injection, though some prefer the interscapular region. The latter has the advantage of being out of the patient's sight. The greatest care

should be exercised in expelling all air from the syringe and in the observance of absolute surgical cleanliness. The pain will be less if the injection is made well down into the subcutaneous tissue, rather than immediately under the skin. The injection should be made

FIG. 8.



Antitoxin syringe.

slowly and the parts should not be rubbed or massaged after it. Before being used the serum should be held to the light. If it is turbid or contains a sediment, it should be rejected.

FIG. 9.

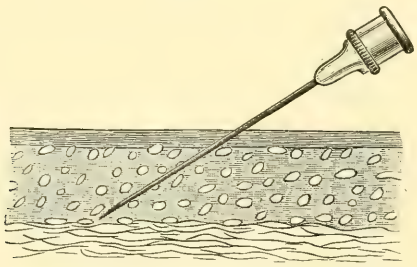


Diagram showing best position of the needle in giving an injection of antitoxin, the point being inserted deeply into the subcutaneous tissue.

The early use of the serum is very important, as shown by repeated reports from every part of the world. A single example will illustrate. Among 4120 cases reported by the American Pediatric Society, the mortality of those receiving the injection on the first day

was 4.7 per cent.; second day, 7.4 per cent.; third day, 8.8 per cent.; fourth day, 20.7 per cent.; fifth day, 35.3 per cent. The rule should be to use the serum in every suspected case without waiting for a positive diagnosis.

During the early days of antitoxin the doses were frequently so small or were given so late that they were utterly useless. Error should be made upon the side of giving more than is required rather than giving too little. The best rules for dosage thus far formulated are those of the American Pediatric Society, and are as follows: For a child over two years old, the dosage of antitoxin should be in all laryngeal cases with stenosis, and in all other severe cases, 1500 to 2000 units for the first injection, to be repeated in from eighteen to twenty-four hours if there is no improvement; a third dose after a similar interval if necessary. For severe cases in children under two years, and for mild cases over that age the initial dose should be 1000 units, to be repeated as above if necessary; a second dose is not usually required.

As to the preparation used, the serum produced by leading American manufacturers is equal in purity and efficiency to any imported. That made by unknown and untried firms should not be used.

The dose should always be estimated in antitoxin units, not in the amount of serum, for one serum may contain five times as much antitoxin as another. An antitoxin unit, while an arbitrary standard, measures very accurately the amount of the curative agent used. A unit is the amount of antitoxin which, when given to a guinea-pig, will neutralize 100 fatal doses of diphtheria toxin of standard strength. The number of units contained in each vial or bulb of antitoxin is printed upon the label.

The beneficial effects of antitoxin are frequently seen within twelve hours, but sometimes do not appear for eighteen to twenty hours. They are sometimes positive and distinct; at others, slow and gradual. The temperature begins to subside; the spread of the diphtheritic membrane is checked; the glandular enlargements become smaller; the color improves. The course of the disease is shorter, and in many instances the constitutional symptoms have subsided before marked changes are observed in the membrane. In general terms it may be said that improvement follows a course similar to that naturally followed by a favorable case, except that it is more rapid.

Certain undesirable symptoms sometimes follow the administration of antitoxin, but their gravity has in many quarters been overestimated. The most common of these are the skin eruptions. A mild erythema sometimes follows the injection and may cause considerable itching and burning. The most common lesion, however,

is urticaria, which usually develops from the eighth to the fourteenth day after injection. Except in a few rare cases, it is not serious, and seems to have no effect upon the course of the disease. Erythema and other skin lesions have been occasionally observed. The cutaneous symptoms are sometimes accompanied by fever and slight constitutional disturbances. They have been commonly attributed to the serum, not to the antitoxin. It is not perfectly certain, however, that this is the fact. There seems to be a large personal element involved in the production of these lesions. Serum from the same bottle may cause an eruption in one individual and have no such effect upon another. Inflammation of the joints is said to have followed the use of antitoxin, but it is a mild complication. Sudden death following the injection has been reported in three or four cases, perhaps a few more. Hundreds of thousands of injections have now been given, but the number of fatal accidents is so infinitesimal that it seems impossible to charge them to antitoxin *per se*. Similar accidents have been reported as following hypodermic injections and the most trivial of operations. Albuminuria is frequently seen after antitoxin has been used and nephritis occurs in a few cases. These are among the most common complications of diphtheria, and there is no evidence that they are more common after the use of antitoxin, if the larger number of recoveries be considered. The same is true of paralysis. It seems clear, however, that antitoxin does not materially prevent these complications, but its effect when given very early has not yet been fully demonstrated.

It has never been claimed that diphtheria antitoxin is of value in any disease except true diphtheria. For cases caused by streptococci and germs other than the Klebs-Loeffler bacilli it is unavailing. In mixed infections it is still of great value, as it removes one serious factor in the case.

Treatment of Nasal Diphtheria.—Nasal diphtheria is always a grave condition. When confined to the anterior nares it is far less serious than when located in the naso-pharynx. In the former location absorption is comparatively slow. In the latter it is very rapid and systemic infection occurs quickly and is usually profound. Nasal syringing, as already described, is very important. Strong antiseptics should not be used, but the nasal passages should be kept clear. Hemorrhage is not uncommon, and when severe precludes the use of the syringe. A solution of antipyrin is one of the most efficient methods of checking such hemorrhage. It may be made as strong as 1 : 4, and may be used as a spray or upon a swab. A plug of cotton saturated with the antipyrin solution in the anterior nares will usually suffice, if the spray fails. The most effective hemostatic in nasal hemorrhage is undoubtedly supra-renal extract. Five grains

of the powdered extract should be dissolved in one drachm of water or a saturated solution of boracic acid. This makes a paste which may be applied by means of a swab in urgent cases. It is best, however, to filter the mixture, and use the filtrate as a spray or by means of a swab or syringe. The solution will keep barely an hour, and should, therefore, be made fresh if it is again required. With this treatment it is doubtful whether it will even be necessary to tampon the posterior nares, an extremely difficult operation in a young child. The astringent preparations of iron should under no circumstances be used. The use of antitoxin in nasal diphtheria should be especially prompt. The dose should be large, and repeated after twelve hours if improvement is not evident.

Treatment of Diphtheria of the Conjunctiva and Skin.—Diphtheria of the conjunctiva is a very fatal condition, and in cases which survive the eye is usually destroyed. Full doses of antitoxin should be given, and should be repeated frequently while the disease continues. Ice compresses should be applied to the eye, care being taken that their use be not so continuous as to do local injury. The eye should be irrigated with a boracic solution every hour or half hour.

Diphtheria of the cutaneous surface is usually controlled without serious difficulty. Strong antiseptics may be applied with greater freedom than in the throat. A dressing of iodoform, either dry or in ointment, is particularly efficacious. The infected area should be covered with a dressing to avoid the danger of infecting the throat.

Treatment of Laryngeal Diphtheria (Croup).—The nature of membranous croup was long a subject of discussion, which has been settled by the bacteriologist. Between 80 and 90 per cent. of cases are due to true diphtheria. Unless shown by culture to be pseudo-diphtheria, every case of croup should, therefore, be considered true diphtheria. Absorption from the larynx is slow, so that the constitutional symptoms are not usually severe. Death results from mechanical obstruction of the respiratory passage. Untreated, it is one of the most fatal diseases of childhood, the mortality being over 90 per cent. Its successful treatment is, therefore, one of the most brilliant achievements of modern medicine. For more than a decade intubation had been regarded as a potent life-saving measure. Since the advent of antitoxin it has been brought into even greater prominence, and is now esteemed more highly than it has been at any other time in its history. Intubation and antitoxin are in a most striking way the complements of each other. Each, alone, is effective in reducing the mortality of one of the most fatal of diseases. Hand in hand they have reduced that mortality to a point that would have been incredible fifteen years ago. This complemental action of in-

tubation and antitoxin is remarkable. Intubation has accomplished all that was ever claimed for it: the relief of laryngeal obstruction. But diphtheria when it has involved the larynx shows a strong tendency to invade other portions of the respiratory tract. Children who die after intubation do not succumb to obstruction of the larynx, but to sepsis or extension of the diphtheritic process into regions inaccessible to mechanical treatment. For years the profession was in search of some means of checking that extension and limiting the disease to the larynx, where it could be rendered harmless by the intubation-tube. Antitoxin accomplishes that result in a very large number of cases. It so controls the diphtheretic process, and so prevents its extension that the disease is confined to the region in which it can be overcome by the tube.

The effects of antitoxin are more marked in croup than in any other form of diphtheria. Among the best results reported before its adoption were those of McNaughton and Maddren, of Brooklyn, who collected statistics of 8383 cases; which showed 24.2 per cent. of recoveries from tracheotomy, and 30.5 per cent. of recoveries from intubation. The best results at that period were in the vicinity of 30 per cent., though a very few operators reported a higher percentage of recoveries. In the second collective investigation of the American Pediatric Society, 1704 cases of croup were reported, with 78.88 per cent. of recoveries. The most remarkable feature, however, shown by this report was the large number of cases which did not require operation. Of the 1704 cases, 1036, or 60.79 per cent., were not operated on, with a mortality of but 17.18 per cent. In 637 cases intubation was performed, with a mortality of 26.05 per cent. Tracheotomy was performed in 20 cases, with a mortality of 45 per cent. These figures mean that with antitoxin 6 cases in 10 did not require operation, and 8 cases in 10 recovered. These statistics have been abundantly confirmed by other reporters, and make the statement fully warranted that the physician who fails to use antitoxin promptly in croup is tampering with human life.

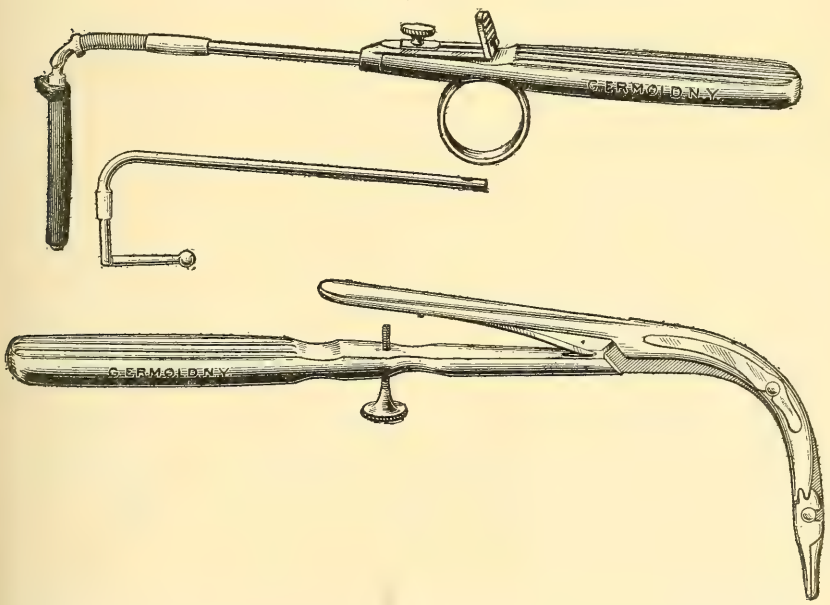
After antitoxin, calomel fumigations have proved most effective, and may be employed should antitoxin be unavailable. There seems to be no valid reason for not combining the two methods. The treatment consists in vaporizing over a spirit lamp ten or fifteen grains of chemically pure calomel, the child being placed under a tent to prevent dissemination of the vapor. It is repeated every two, three, or four hours, according to the severity of the symptoms. Several manufacturers make an apparatus for this purpose, but it can be done equally well by heating the calomel in a spoon or on a strip of tin over a spirit-lamp, which should be placed in one corner of the tent in a basin half full of water to prevent accidents should it be over-

turned. It does not cause salivation of the child, as might be expected; but that accident has occurred to attendants who have inhaled the fumes. The sublimation should not be done too rapidly, for the fumes, if too concentrated, cause choking and frighten the child. The effects of the treatment are sometimes very marked and are seen at once.

Turpeth mineral and other depressing emetics, steaming, and solvents are now but little used. The depressing effects of emetics are dangerous, and the inefficiency of the other methods renders their use disappointing. Constitutional measures should be used as in pharyngeal diphtheria, particular attention being given to feeding and stimulation.

Intubation.—To O'Dwyer the world is indebted for this great and beneficent invention. The most satisfactory results are obtained by using the instruments as left by him. They are the result of enormous clinical experience, profound thought, and years of anatomical study. Most of the modifications of recent years are crude and often dangerous, and can only bring disrepute upon the operation. O'Dwyer's instruments are an introducer, an extractor, a gag, a gauge, and six tubes. The accompanying plate represents the instruments as now produced by Ermold, the original maker of the

Fig. 10.



O'Dwyer's intubation instruments, showing introducer with a tube attached in proper position for inserting, obturator removed from introducer, and modified form of extractor.

O'Dwyer instruments. They have been modified only in certain details to make disinfection more easy.

A tube, selected according to the age and size of the child, is placed upon the introducer and a silk cord is threaded through the eyelet. The child is carefully rolled in a sheet, so as to pinion the arms and feet. Care must be taken that the sheet is not so high and clumsy about the neck as to obstruct the operator. The child is then taken upon the lap of some strong person and held upright with the back of its head against the chest of the person holding it. Its feet are taken between the knees and held firmly, while its arms are held securely under the sheet. A second person holds the child's head by grasping it firmly on each side. When the gag has been placed between the teeth, its handles project on the left side of the face, and are held in position by the person who is holding the head. The head should be held firmly upright, as if the body were suspended from it. The operator is seated in front of the child, and when the gag is in position he passes the index finger backward into the throat until it reaches the epiglottis, which is held forward to leave a passage clear into the larynx. In some cases the tissues are so soft that the operator cannot be certain of his landmarks. If the finger is passed well down and brought forward, it will touch a hard nodule, which is the upper part of the cricoid cartilage. The epiglottis lies in front and above it. The glottis having been uncovered, the tube is carried into the back of the throat on the introducer with the handle depressed. As soon as the tube reaches the glottis the handle is sharply raised to give the tube a forward direction. It is at the same time gently pressed downward, and when in the larynx the finger catches the top of the tube as it is detached from the introducer. The finger is still kept over the tube to settle it into place and make certain that it is not dislodged by the obturator. When the tube is in place, after a few coughs, the child begins to breathe more freely without stridor. When it is perfectly certain that the tube is in position and the child is breathing with freedom the cord may be cut and withdrawn, the finger being again placed upon the head of the tube to prevent its dislodgement. Should there be doubt as to the position of the tube, or a suspicion of detached membrane below it, the gag should be removed and the cord drawn to the side of the mouth and fastened to the ear. The child must be constantly watched lest he catch the cord and dislodge the tube. As soon as it is certain that the child is breathing freely through the tube, the cord should be removed.

Efforts at introduction should be very short, for breathing is obstructed during their continuance. The most frequent error is introduction into the œsophagus. The tube sometimes enters the ventricles, which are simply pockets on either side of the glottis. When the tissues are softened by disease a false passage may readily

be made if any force be used. In very rare cases the false membrane is stripped down and occludes the end of the tube and the child fails to breathe. The tube should be at once removed by the cord and the child forced to breathe. A little clear whiskey, by inducing coughing, is usually the most certain means of accomplishing this. Forcible compression of the chest may be employed if this fails, and this failing, tracheotomy, but the latter contingency virtually never arises.

For removing the tube the same preparations should be made as for intubation. The finger is placed on the head of the tube and the point of the extractor is inserted within the opening. The extractor is opened and the tube quickly withdrawn. For many operators this is somewhat more difficult than inserting the tube. Except in emergency, the tube should not be removed unless the operator can devote an hour to watching the case, as dyspnœa sometimes results from swelling of the mucous membrane after the pressure of the tube is taken away. Spasm of the glottis or paralysis sometimes occurs, which may necessitate reintubation. This spasm sometimes subsides after a few minutes. It may be lessened or prevented by a dose of opium given an hour before extubation. No nourishment should be given for several hours before that operation, as vomiting sometimes follows.

Trouble is frequently experienced in feeding, for choking is common and some children will not try to swallow. Milk is usually taken easier than solid nourishment. Difficulty in swallowing may usually be overcome by holding the child across the lap with the head below the level of the body. Liquids can thus be taken, for they do not flow into the larynx by gravity. This accident, when it happens, causes no trouble farther than choking. Food will never enter the bronchi. Semi-solid substances are frequently swallowed more readily than fluids. Undiluted condensed milk, thick gruels, cornstarch, jellies, and similar substances may be used. The tube is sometimes coughed out, but it rarely happens that dyspnœa returns before the physician can be summoned. Tubes have many times been coughed up and swallowed. If dyspnœa returns, an examination should be made to determine whether the tube is in the throat before other measures are taken. A swallowed tube will be passed in due time and will do no harm. The tube sometimes becomes gradually filled with tenacious secretions. It must then be removed and cleansed and returned to the throat. It is left in position from three days to a week or longer.

Most of the objections made to intubation in its earlier days have proved to be unfounded. The tube cannot descend below its natural position. Ulceration of the vocal cords is impossible, for the tube

does not rest upon them, but upon the inferior ventricular bands. Ulceration sometimes occurs at the lower end of the tube in the trachea, but is rarely, if ever, serious. Blocking of the tube by membrane very rarely occurs. If the opening becomes completely clogged, attempts to cough are sufficient to expel the tube. The large masses which are sometimes forced through the tube are surprising. It is kept clear upon the same principle that makes the jetty system at the mouth of rivers so effective. The difficulty of feeding sometimes proves a real objection to intubation, but it is only in the rarest cases that it cannot be overcome.

The advantages over tracheotomy are very great, the following being the most apparent: the operation is simple, is quickly performed, and requires few instruments. No anæsthetic is required. There is no hemorrhage and no surgical shock. Little objection is made by parents; hence it is rarely refused when indicated. There is no fresh wound to be infected by diphtheria or to remain open after removal of the tube. No skilled after-management is required.

Tracheotomy.—In America tracheotomy has been completely supplanted by intubation in diphtheritic croup. Wider experience shows that when intubation fails tracheotomy is useless. Jacobi, who did more than any one else to popularize tracheotomy, recently wrote as follows: "I can only say that for years I have not seen a case in which intubation would not take the place of tracheotomy, and have, therefore, not performed the latter." He believes that it is probable that secondary tracheotomies, which are still performed in Europe, when intubation is alleged to be insufficient, will not be considered requisite in the future. Tracheotomy still has its uses in certain diseases and tumors of the air-passages above the trachea. As a means of treating laryngeal diphtheria it is so rarely indicated that farther discussion in this place is unnecessary. The operation and instruments required are fully considered in every work on surgery.

Treatment of Complications.—Otitis, pneumonia, and nephritis when complicating diphtheria should receive the treatment indicated under any other condition. It should be remembered that the mere presence of albumin does not necessitate active measures. It is usually due to simple degenerative changes which disappear as the disease subsides. Acute exudative nephritis not infrequently occurs, and is accompanied by few symptoms of uræmia, and is rarely the cause of death. Acute diffuse nephritis may occur with all the signs of uræmia and may cause the death of the patient. The treatment is that indicated for the disease under other circumstances. Paralysis, while there is no specific treatment, is usually benefited by iron and nux vomica in tonic doses. Massage of the paralyzed parts with the ap-

plication of hot oil undoubtedly proves of some benefit. Electricity is of but little value as a remedial agent.

Treatment of Pseudo-diphtheria.—Every case presenting pseudo-membrane in the throat should be considered as one of diphtheria until proof is furnished to the contrary. Bacteriological examination is the only means of deciding this with certainty until the disease has so far run its course that but little treatment is required. When the case is known to be pseudo-diphtheria the local treatment is of chief importance. It should be that already outlined for true diphtheria. Constitutional treatment is not usually required. The Board of Health of New York City found the death-rate to be 2 per cent. for pseudo-diphtheria when it was 27 per cent. for true diphtheria. Stimulation is sometimes required, and the diet should be that given to diphtheria patients.

The use of anti-streptococcic serum has not fulfilled the expectations based upon it. Although numerous cases have been reported as terminating favorably, at the present writing there is no evidence to warrant reliance being placed upon it. This results chiefly, no doubt, from the fact that constitutional infection has already occurred when the symptoms appear. In diphtheria the pseudo-membrane when detected early gives warning of the constitutional infection which is to follow. Hence, the serum has ample time to do its work. If it is not given until the third or fourth day, when systemic infection has occurred, statistics show that it is of but little avail. This is apparently the reason why the serum treatment of diphtheria has succeeded while that of other diseases has failed.

SPASMODIC CROUP AND RICKETS.

By FLOYD M. CRANDALL, M. D.

SPASMODIC CROUP.

A TENDENCY to spasmodic laryngitis is frequently inherited. In such cases total prevention is difficult. Among physical factors predisposing to croup, adenoid growths of the pharynx are the most potent. The most common exciting causes are exposure to cold and attacks of indigestion. To prevent taking cold, cool sponging of the arms, neck, and shoulders daily is the most effective measure that can be adopted. The child should have exercise in the open air and should sleep in a well-ventilated and not overheated room. While carelessness or lack of judgment may do serious harm, nothing is gained by the excess of caution sometimes seen among the mothers of children subject to croup. Loud screaming or crying while at play in the open air on cold, raw days may precipitate an attack at night. As a prophylactic, cod-liver oil is a remedy of considerable value. Children subject to croup or bronchitis should take it for one, two, or three weeks of every month during the cold weather. Iron is also of value in anæmic children.

Treatment.—Among the many new drugs, none has proved more effective in croup than the time-honored ipecac, followed by an opiate. An emetic serves a double purpose: it unloads the stomach and, through its power to relax spasm, relieves the croup itself more or less completely. In many cases emesis is not necessary, for the child improves when he begins to be nauseated. The wine of ipecac is more prompt and effective than the syrup. Twenty drops may be given every fifteen minutes until the child is relieved. The ipecac may be followed by a full dose of paregoric, of which 10 minims (equivalent to 20 drops) may be given at one year and double that amount at two years. This dose may be repeated if necessary later in the night. The administration of a tablet of "brown mixture" (containing tartar emetic $\frac{1}{60}$ grain and opium $\frac{1}{25}$ grain) is an effective and easy method of treatment. The tablet may be repeated in thirty minutes if there is no relief. In many children antipyrine acts efficiently in allaying spasm, particularly when the temperature is high. At two years 1 grain may be given every twenty minutes

for three doses. In some children bromide of sodium is effective in breaking up an attack. It may be given in doses of 5 grains at two years.

Local measures are sometimes more effective than drugs. When the attack is not severe, thorough rubbing of the neck and chest with hot camphorated oil is all that is required. A large sponge wrung out of hot water and placed over the throat aids in giving relief. A hot flaxseed poultice over the throat and chest is more permanently effective. The croup-kettle is one of the most prompt and efficient means of breaking up an attack. A tent may be quickly made by placing a sheet over the crib, raising it if necessary by means of hoops or sticks tied to the head and foot. The pipe of a croup-kettle is then introduced and the atmosphere under the tent is thoroughly saturated with steam. Plain steam is quite as efficient as medicated.

In classical cases, on the morning following the attack the child is comparatively well, except perhaps for a slight cough. He will have a recurrence of the attack of a milder type on the following night, and still another on the third night. It is wise, therefore, to give an occasional dose of ipecac during the day or a brown-mixture tablet, increasing the doses during the afternoon and giving a double dose at bedtime. In New York and other damp climates the disease rarely follows this classical course. On the following morning the child has a cough more or less troublesome, with slight fever, and the initial attack of croup is prone to be followed by bronchitis, which continues from a few days to two weeks or more. The mixtures containing nauseating expectorants and syrups so frequently given in this condition are chiefly effective in disturbing the stomach and destroying the appetite. Brown-mixture tablets or tablets containing $\frac{1}{100}$ grain each of antimony and ipecac are effective and free from the disadvantages of the ordinary cough syrup. When the secretion becomes free, 1 grain of ammonium chloride, administered in water alone, is effective. It is almost tasteless, and rarely disturbs the digestion.

RICKETS.

Observations of recent years have added much to our knowledge of the pathogenesis of rickets and its rational treatment. We are fully warranted in classifying it among the preventable diseases. The only exception, perhaps, is in the case of a southern race, like the Italian and negro, when transferred to a northern climate. Rickets is essentially dietetic in its nature, but bad hygiene is an important

element in its etiology. It is a disease of nutrition, complex in nature, and not due to a single cause. Animal experimentation and clinical experience both teach that it may result from dietetic errors alone. The diet which will most certainly be followed by rickets is one deficient in fats. If deficient in proteids also, the certainty of rickets is increased. If to this is added an excess of carbohydrates, we have the diet *par excellence* for the production of rickets. Such a diet we have in condensed milk and certain of the proprietary foods. The excess of carbohydrates in those foods produces fat. Hence, we often see in children thus fed striking examples of "fat rickets."

Of the unhygienic conditions tending to produce rickets, lack of sunlight is apparently the most potent. It is the children in the tenement regions of large cities who suffer most. In addition to defective diet, these children, confined to dark and unwholesome rooms, are perpetually debarred from sunlight and pure air. Those who might tolerate lesser errors in diet in good sanitary surroundings will become rhachitic in unwholesome ones.

Methods of prevention in rickets are dietetic and hygienic, as indicated by a study of its etiology. The first involves a knowledge of the modern science of infant feeding. The general outline of the diet is as follows: give an adequate percentage of fat; exclude starches from the diet of infants under six or eight months, and give them in moderation after that time; give the child abundance of sunlight and air and keep him in the best hygienic surroundings possible. In addition to this, clothing, bathing, and other details of hygienic care should not be neglected. It should be understood, however, that rickets may develop in the best of surroundings if the diet is faulty.

Rickets is rare in breast-fed babies, but is sometimes seen among the Italians and negroes of the Northern States. Examination of the breast-milk usually shows it to be deficient in fat. An attempt should, therefore, be made to increase the fat by placing the mother on a diet of meat and albuminoids and improving her nutrition by the use of iron and other tonics. If the milk fails to improve under this management, the baby should be weaned and placed on a milk-mixture containing as much fat as can be well digested. If the patient is already artificially fed, the fat should be slowly and cautiously increased, and perhaps the proteids also. It is a great error to overdo the giving of fat and to rely upon it alone. In older children milk or cream should form an important part of the diet, together with eggs and meat-juice. In the majority of cases the disease will be checked by proper modifications of the diet.

Hygienic treatment consists in attention to clothing, bathing, and airing, and above all in keeping the child in the air and sunlight. When possible, city children should be sent into the country, sea-

air being particularly beneficial. Much judgment is required in making changes in diet and habits of life. Sudden and radical changes should be avoided. It is better to make the desired modifications slowly and by gradual steps. Rhachitic children often have a precarious hold upon life, and are seriously disturbed by causes that a normal child would not feel. Particular caution must be observed in making sudden and extreme changes in the diet.

While of little importance as compared to dietetic and hygienic management, medicine may aid in checking the progress of rickets. Cod-liver oil is the most important agent, and should not be omitted when it is tolerated by the stomach. Phosphorus has been much lauded, but in the writer's experience, in a large number of cases, it has failed to give the results reported by many observers. It is most efficacious in the earliest stages and among young infants. The elixir of phosphorus is an available preparation, of which 5 to 10 or 15 drops may be given three times a day. The lime salts and their preparations were for many years considered necessary to the adequate treatment of rickets, but experience has shown that they act only as general tonics. Their use resulted from the erroneous idea that rickets is essentially a disease of the bones, the fact being that almost every tissue and organ of the body is involved. Iron and arsenic are valuable in the treatment of the anæmia which so commonly accompanies rickets.

The natural history of rickets should not be forgotten in estimating the effects of treatment. The acute stage is usually seen between the sixth and sixteenth month. The thickenings and deformities seen later are but the result of the acute stages. Many of these pass away slowly as the child grows older, while some are permanent. Much may be done to prevent deformities by tonic treatment and local massage, by which the muscles are strengthened and the limbs drawn into their natural contours.

There has been considerable discussion as to whether rickets is a medical or a surgical disease. Such discussion has resulted from failure to discriminate between the various stages. In the first, or active, stages it certainly requires non-surgical treatment. In the later stages, when deformities have resulted, surgical treatment is required, and the patient is then a suitable one for the orthopædic surgeon, who can do much to give him relief.

DISEASES OF THE MUCOUS MEMBRANE OF THE MOUTH, AND MUMPS.

By FLOYD M. CRANDALL, M. D.

CATARRHAL STOMATITIS.

This disease occurs in two stages, a dry and a moist stage. In the first there are pain, heat, redness, and dryness of the mucous membrane of the mouth and tongue. In the moist form, in addition to the pain, heat, and redness, there is more or less secretion. It may result from injury, and in rare cases is seen during dentition. It occurs most commonly during the course of the infectious fevers, and usually accompanies the exanthem of the eruptive diseases. It follows the accidental swallowing of acids or caustic chemicals, and may follow the frequent administration of weak solutions of irritating chemicals. In infants it sometimes results from the habit of giving milk too hot. Some children are especially prone to catarrhal conditions of the mucous membrane, particularly children of the so-called scrofulous type. In them catarrhal stomatitis is especially common, and is liable to complicate any febrile condition.

In ordinary cases a mild alkaline wash is the most effective treatment. Dobell's or Seiler's solution may be employed, or a mild solution of boracic acid. These solutions, as well as the food, should be used cold. The child will often take cold liquid nourishment when it refuses warm. Small pieces of ice may be given at short intervals. Chlorate of potassium and cocaine should not be used. During the course of the infectious fevers cleanliness of the mouth should be maintained, but all harshness should be avoided. In the more severe cases with superficial ulceration, tannic acid in powder is usually effective. Glycerole of tannin may also be used. A powder consisting of equal parts of bismuth and burnt alum may be employed when the ulcerations are rebellious to treatment. For the deeper ulcerations the solid stick of silver nitrate must be employed, the lesions being touched lightly with it. As an astringent wash to be used when the disease is diffuse, a solution of alum in water (5 to 10 grains to the ounce) is effective.

Two errors in management are accountable for much stomatitis in

children. The one is neglect of the mouth; the other, the opposite extreme of too much treatment or too harsh treatment. Particles of milk left upon the tongue or in folds of the mucous membrane decompose and form acrid products which denude the surface of its epithelium. Such denuded spots form admirable culture-fields for bacteria, which are carried into the mouth by unclean hands or nipples, or by the contrivance known as a "comforter," just picked up, perhaps, from the floor. On the other hand, the surface may be denuded by the finger of the nurse in intemperate zeal for cleanliness. While cleanliness is of the utmost value in preventing stomatitis, harshness and overtreatment may be as harmful as uncleanliness.

The prevention of catarrhal stomatitis is important, for it is often the first stage of other more serious conditions. In children, the class of patients in which it is most common, it is largely a preventable disease. The chief measure of prophylaxis is cleanliness, which requires not alone frequent washing of the mouth, but attention to every detail of feeding and care of the feeding implements.

FOLLICULAR STOMATITIS.

This is sometimes known as herpetic, vesicular, or aphthous stomatitis. It is characterized by small, round, yellowish ulcers, appearing singly or in groups, suddenly or in successive crops on the tongue, lips, or cheeks. The saliva is somewhat increased, but is never fetid, and bleeding is rare. It is most common between the second and sixth years. Soreness and pain are often excessive, frequently causing the child to refuse food for several days. Catarrhal stomatitis frequently precedes and usually accompanies the follicular ulcers. The cause is unknown. Analogy leads to the belief that the disease is due to bacteria; but bacteriological investigations have thus far proved negative. Nomenclature of the diseases of the mucous membrane of the mouth has been much confused, and the disease now under consideration has been frequently, but erroneously, called ulcerative stomatitis.

In addition to the measures advised for the treatment of catarrhal stomatitis, the ulcerations may be touched with powdered burnt alum or with a solid stick of sulphate of copper. The disease is self-limiting, and it is doubtful whether it can be materially shortened by treatment. Considerable relief may be given by alkaline washes. The indigestion which frequently accompanies the disorder should receive its appropriate treatment. Chlorate of potassium is not beneficial, and even in weak solutions causes extreme pain. Cocaine

is unsafe, and its action is temporary. If the ulcerations become deep and heal slowly, the solid stick of silver nitrate should be used; but this is rarely necessary. In most cases the use of cold liquid nourishment and a bland alkaline wash, like Seiler's solution, constitute the most satisfactory treatment.

The *chronic catarrhal ulcers* seen in adults, while they resemble somewhat the follicular stomatitis of children, are quite different in their nature. They are frequently single, and rarely occur in large numbers. They are deeper, larger, and more irregular in outline than the follicular ulcers, and are extremely painful. They are chronic in their course and often rebellious to treatment. Decayed or broken teeth will sometimes prolong their course almost indefinitely, hence their removal is an important feature of treatment. The disease is not infrequently accompanied by indigestion and constitutional disturbances. The application of alum or the solid stick of copper sulphate is effective in many cases, but frequently cauterizing with silver nitrate is necessary. This should always be preceded by cocaine. In some cases the application of silver nitrate is followed by acute inflammation and much pain. This is usually temporary, and is best treated by dilute Seiler's solution or a solution of glycerole of tannin in water (1 drachm to 4 ounces). When the reaction is severe, it is best not to use the silver again, but rather the milder, but slower, alum or copper.

A bland alkaline mouth-wash should be prescribed in all cases, and the digestion should receive attention. For this purpose the mixture of rhubarb and soda is more commonly indicated than any other treatment. Iron and the bitter tonics are often indicated, for the disease rarely occurs in persons in perfect physical condition. Catarrhal stomatitis, which frequently accompanies the ulcers, should receive the treatment already outlined.

ULCERATIVE STOMATITIS.

This usually consists of a single deep ulcer, having a thick areola surrounded by a zone of œdema. It always appears first on the gums. The breath is foul and the saliva is profuse, bloody, and fetid. The secretion of saliva, in fact, is more profuse than in any other disease. Ulcerative stomatitis does not occur when there are no teeth. In America it is less common in children then in adults. It should not be confounded with follicular stomatitis nor with the catarrhal ulcers often seen upon the tongue and lips of adults. The mouth should be at once cleansed thoroughly, and for this

purpose peroxide of hydrogen is the most available remedy. It should be diluted from four to eight times, as a stronger solution is frequently very painful. Teeth when loosened should be extracted. Decayed teeth should also be at once removed, as they will retard or prevent recovery. Chlorate of potassium is justly regarded as a specific. A teaspoonful of a saturated solution, well diluted, may be given every two hours to an adult for the first twenty-four or thirty-six hours. The interval should then be lengthened. It appears to have both a local and a constitutional action. The results of this treatment are usually very satisfactory; they are frequently brilliant and striking. Its chief disadvantage is the pain which it frequently causes. This, however, gradually subsides with the successive doses. The use of cocaine is not to be advised. After checking the salivation, several days are required for the ulcer to heal. Small doses of chlorate of potassium may be continued for several days after healing is complete. Relapse is not uncommon, and should be immediately met by active treatment.

Occasionally the ulcer refuses to heal. This is usually due to a diseased tooth or to necrosis of the jaw. Such a tooth should be at once removed, and diseased bone should receive appropriate treatment. In stubborn cases healing may be hastened by the application of burnt alum or the stick of silver nitrate preceded by cocaine.

General tonic treatment is important, for the disease usually occurs in debilitated and enæmic subjects. Iron is particularly indicated, while arsenic and nux vomica are valuable additions to the treatment. The following combination renders excellent service in all diseases of the mucous membrane of the mouth in ænemic subjects:

℞. Mass. ferri carbonatis (Blaud), gr. v;
Hydrarg. chloridi corrosivi, gr. $\frac{1}{100}$;
Strychninæ sulphatis,
Acidi arsenosi,
Capsici, āā gr. $\frac{1}{60}$.—M.
M. Ft. pil. No. i.
Sig. One three times a day.

Prompt and vigorous treatment should always be adopted, for the disease is in itself a serious one, and it should not be forgotten that it may produce gangrenous stomatitis. The stomatitis depending upon metallic poisoning, particularly by mercury, is closely allied to this form of disease. Lead, copper, phosphorus, and iodine may also produce it. The treatment is practically the same as that outlined. The stomatitis of scurvy, syphilis, and rickets is also of the same nature. In these conditions, however, cure can rarely be effected without appropriate constitutional treatment.

Ulcer of the hard palate is occasionally seen in young infants. It is superficial in character and rarely shows acute inflammation. It usually results from a rough nipple, or from injury due to harshness in cleansing the mouth. It is particularly common in marasmic children, and is then rebellious to treatment. In other cases, upon removal of the cause, it yields readily to the treatment prescribed for follicular stomatitis.

GANGRENOUS STOMATITIS.

Noma, or cancrum oris, is a moist gangrene beginning usually on the inside of the cheek, extending with great rapidity and causing widespread destruction of tissue. It may follow any form of stomatitis, particularly the ulcerative, but is most frequently secondary to some infectious or wasting disease. It more often complicates measles than any other disease, but is fortunately very rare. It is undoubtedly due to germ action, pure cultures of streptococci having been found in many cases. When fully developed, it is strictly a surgical disease. Palliative treatment should never be relied upon. Excision and cauterization with the Paquelin cautery is the most effective treatment.

Prevention consists in the early treatment of stomatitis and in cleanliness of the mouth. Although the local treatment of gangrenous stomatitis is surgical, constitutional treatment must not be omitted. Stimulants should be begun early and used freely. In addition to alcohol, strychnine and digitalis should be prescribed in full doses. Nutrition should be maintained as far as possible by means of concentrated diet. It should be given frequently in small quantities if the stomach is irritable. Beef-juice, meat-jelly, eggs, and peptonized milk may be utilized. No effort should be spared to preserve the strength and maintain general nutrition.

PARASITIC STOMATITIS (THRUSH).

This is due to the growth of a fungus upon the mucous membrane or within its superficial layers. It occurs chiefly in young infants, and appears on the tongue, lips, and cheeks, at first in small spots soon becoming membranous. It is of whitish or yellowish color, and is sometimes mistaken for milk left after feeding. The mucous membrane around and between these membranous spots is red and inflamed, as in catarrhal stomatitis. Occasionally, when the

disease is severe, removal of the exudate leaves shallow ulcers. Thrush is frequently accompanied by gastric disorders, but the exudate itself rarely, if ever, extends into the œsophagus.

Prophylaxis consists in absolute cleanliness of the mouth as well as of the nipples and bottles. The nipples should be kept in a weak solution of borax, and the mouth should be washed with a borax solution or with plain water before each feeding. In breast-fed babies the nipples should be washed before nursing. Treatment consists in thorough but very gentle removal of the exudate. The most effective solution for this purpose consists of borax and bicarbonate of sodium in water. This may be applied upon a soft cloth wrapped upon the finger or by a cotton swab.

℞. Sodii bicarbonatis, gr. v;
Sodii boratis, gr. v;
Aquæ, ℥j.—M.
Sig. Mouth-wash for thrush, to be used four times a day.

While removal of the exudate is important, all roughness and pressure should be strictly guarded against. This solution may be used three or four times a day, and should be followed by a saturated solution of boracic acid. The use of honey or syrup as a menstruum for local application should never be permitted. By their fermentation they aggravate rather than relieve the disease. Indigestion and diarrhœa should receive prompt and appropriate treatment.

MUMPS.

Mumps is undoubtedly contagious before the swelling appears, and for several days after it has disappeared. The child should, therefore, be isolated for ten days after the swelling has subsided. The period of incubation is variable, ranging usually between 14 and 21 days, 17 days being the most common period.

In many cases the child requires little or no treatment. The fever, when it ranges high, should be treated by citrate of potassium and sweet spirits of nitre, or by small doses of phenacetine. The accompanying prescription is palatable and renders good service during the febrile stage:

℞. Spts. ætheris nitrosi, ℥ij;
Liq. ammonii acetatis, ℥ss;
Glycerini, ℥ss;
Aquæ cinnamomi, q. s. ad ℥iij.—M.
Sig. A teaspoonful every two hours to a child of five years.

Local pain is sometimes best relieved by the ice-bag. After it has been used for a short time it may cause increased pain. In that case hot poultices or moist applications usually give relief. As a rule, hot applications give more comfort than cold. In ordinary cases applications of hot camphorated oil are very soothing, and constitute the best local treatment that can be adopted. Pain will be decidedly less if the swellings are kept covered by a light dressing to protect them from draughts and cold air. In severe cases, in which suppuration occurs, the gland must be treated like any abscess. A mouth-wash of boracic acid should be freely used. Orchitis, when it occurs, should receive the treatment it would under other circumstances. It commonly subsides spontaneously.

PNEUMONIA, CROUPOUS, AND CATARRHAL.

By H. A. HARE, M. D.

It is of very great importance from both the point of view of the pathologist and the therapeutist that a clear differentiation should be made by the general practitioner between that form of pneumonia in which the exudate is croupous or fibrinous and due to infection by a specific micro-organism, the micrococcus lanceolatus, and that form of pneumonia not due to infection by this specific germ, but to any micro-organism capable of producing inflammation about the bronchi. In the first disease we have a plastic exudate poured out into the vesicular portions of the lung, which readily undergoes resolution with the development of crisis. In the so-called catarrhal form the primary pathological process consists chiefly in an inflammation of the tissues surrounding the bronchial tubes, and it is by an extension of this process that sufficient of the lung is involved to cause the characteristic signs of consolidation. In one case a lobe is involved, giving the name lobar pneumonia to the croupous form; in the other, the process is often more widespread and yet more limited in the sense of being in patches—namely, a lobular pneumonia—or, as it is often called, broncho-pneumonia. In this latter form the tendency is not to speedy resolution with the development of a crisis, nor is it in its onset similar to the croupous form. The croupous type is sudden in onset, and often attacks a lung apparently in perfect health, while the catarrhal form most frequently develops as a complication of some already existing malady. From the standpoint of bacteriology, pathology, and morbid anatomy the two diseases are as different as two diseases involving pulmonary tissues can well be. They are widely different in their clinical history, course, and general manifestations. As a matter of fact, they are different in every way save that both give the physical sign of dulness on percussion over the area involved.

In a system of therapeutics space does not permit me to discuss more minutely the differences in these maladies, but it is of vital importance that in speaking of the therapy of pneumonia a clear idea of the form of the disease under discussion be first obtained. The fact that the term pneumonia is often carelessly used to indicate any

state of the lung which gives the physical signs of consolidation or lack of resiliency, whether it be croupous, catarrhal, tubercular, or otherwise, has resulted not only in a sad jumble of the statistics of croupous pneumonia, but also a still more regrettable confusion of therapeutic reports and facts. Oftentimes a plan of treatment found most efficacious in one form of pneumonia fails entirely in the hands of another practitioner who employs it in another form, either because the first physician did not specify the type or the second one did not separate the two forms of the disease. The two maladies are so utterly different that in some directions at least their management must vary greatly. Not long since a large number of statistics were collected by an American physician as to the value of local applications of cold to the chest in "pneumonia," but no attempt was made to differentiate between the croupous and the catarrhal form, and therefore the statistics lost much of their value.

Not only is it necessary to differentiate the forms of pneumonia, but it is important to distinguish between the various stages of the disease in each case, and, furthermore, to consider the condition of general health of the individual patient both before and during the illness. Manifestly, the morbid state in one stage of the disease under discussion must be very different from that at another stage; and it is equally manifest that treatment applied to one case of croupous pneumonia in the early stages must be quite different from that used in another patient at the same period of the disease. In other words, the physician must consider the personal equation or individual need of each patient as he meets it in practice, and there can be no routine plan of treatment laid down or advised. Many years ago a homœopathic practitioner of Philadelphia boasted to his patients that he had "never lost a patient from pneumonia if called early enough in the disease." This remark, with its manifest double meaning, seemed a wonderful boast until it was seen that in all the cases that died he had not seen them early enough, and in all the cases that lived he had seen them early enough.

CROUPOUS PNEUMONIA.

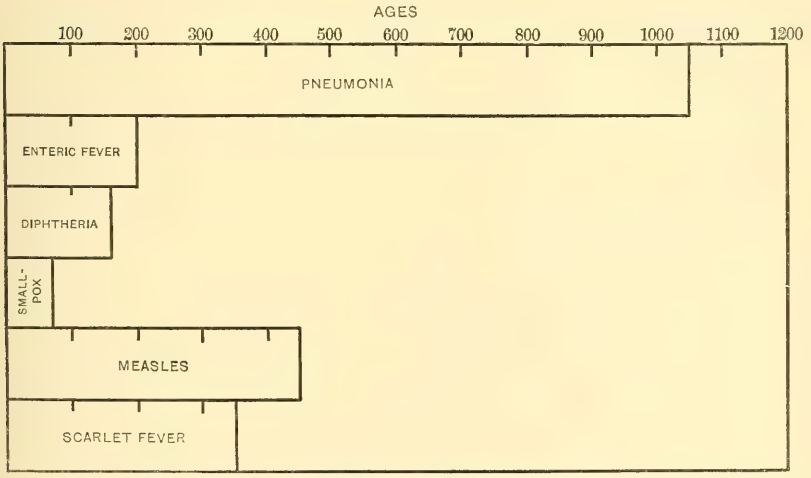
There are two aphorisms which I am in the habit of emphasizing to my classes: one is that "when called to care for a patient through an attack of illness the physician should be a watchman all the time, and a therapeutist only when necessity arises." Surely there is no disease commonly met with in which this holds true more than it does in pneumonia. The second is that in all acute infectious dis-

eases, and particularly so in croupous pneumonia, patients may be divided into three classes : namely, those who are so mildly ill that all they need is good care and little or no active treatment ; cases, on the contrary, so malignant that nothing can be done which will produce cure ; and a third class which, lying between these two types, is capable of cure, but only when the individual is aided by the most skilful treatment.

To attempt to discuss the treatment of pneumonia without recognizing these facts is futile, for no one who has met this disease can fail to recall cases which, so far as human foresight can tell, were doomed from the first. My belief in the existence of a class in which patients will get well if let alone is confirmed by the fact that I have frequently seen them get well when treated so badly that nothing except extraordinary recuperative power could have enabled them to withstand the disease plus the efforts of the well-meaning attendant.

That the question of how croupous pneumonia should be treated is an important one is shown by the very interesting statistics recently collected for the *Practitioner* by Hector Mackenzie. As is seen in the accompanying diagram, pneumonia causes very nearly as many

FIG. 11.



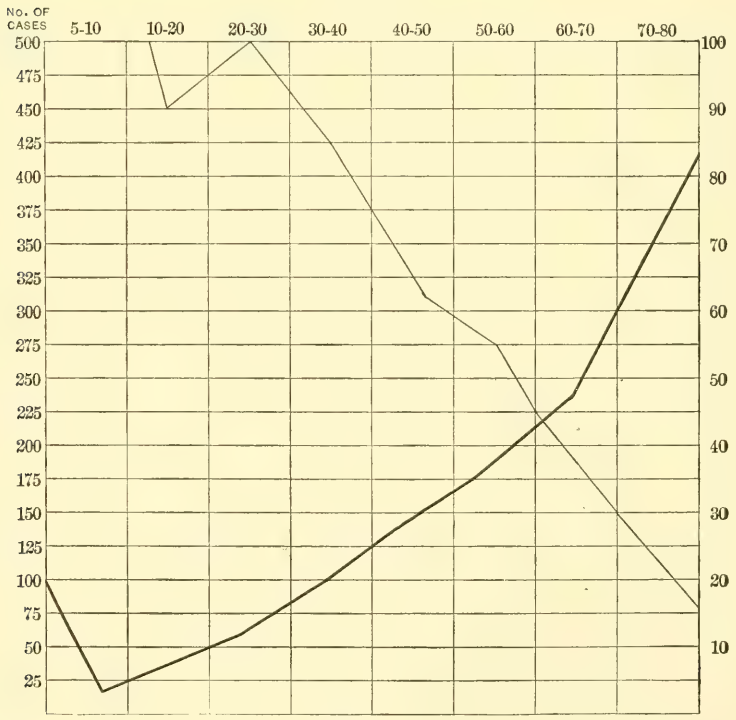
Showing the relative numbers of deaths per million living, from pneumonia, enteric fever, diphtheria, small-pox, measles, and scarlet fever, from 1881 to 1890, as given in the Registrar-General's Report. (MACKENZIE.)

deaths as typhoid fever, diphtheria, variola, measles, and scarlet fever put together ; and again, Mackenzie says : " If we take all ages and both sexes the deaths from pneumonia amount to 5.6 per cent. of the total number of deaths from all causes." It is to be recalled, however, that a certain proportion of these cases are probably of the catarrhal type, because the importance of the differentiation we have

just made is not recognized in making mortality returns by the physicians in attendance. These facts are still further emphasized if we recall the fact that the combined statistics of Mackenzie, Wells, and Wilson Fox show that in a population of 30,000,000 no less than 220,830 persons annually suffer from pneumonia, and that 31,950 annually die of it.

The question naturally arises, How many of these cases can be saved by treatment instituted at the proper time? Manifestly, those individuals who come under our care so late in the malady that no possible chance of recovery exists should be counted out of the statistics. Again, we must recognize that certain ages are, on the one hand, singularly exempt from death due to pneumonia, and that other ages are so susceptible that recovery is almost out of the question. Every practitioner of medicine is aware that croupous pneumonia in young children is rarely fatal, while in advanced years it is often a hopeless fight against the disease from its very inception. These facts are well illustrated in the following diagram of Mackenzie:

FIG. 12.



Showing the number of cases of pneumonia occurring annually in a standard population of one million, and the rate of mortality at different age periods. The light line shows the number of cases, the heavy line the rate of mortality. The figures on the right refer to the rate of mortality.

Should a practitioner at any time believe that his plan of treating this disease is particularly efficacious, let him first collect a sufficient number of cases to give statistical information of real value. These will have to be in very great numbers to avoid error. Let him then carefully eliminate all cases possibly of the catarrhal type rather than croupous; then discover how many of his cases were in the decades of life in which recovery naturally takes place or death generally occurs; and, finally, clearly decide the condition of the individual patients as to their general health and strength. If the physician is inclined to believe that a method of treatment used by him is capable of aborting this malady, or bringing the illness to an early close, he should bear in mind that the specific micro-organism producing it is not very tenacious of life, and that it is by no means unusual for the crisis commonly met with as late as the ninth day to develop as early as the third or fourth. When these factors are considered, he must still determine the virulency of the infection, for in one case it may be mild and in another severe; in one the lung area involved may be great and the toxæmia slight, in another it may be small and the toxæmia fatal.

As a matter of fact, it is almost impossible to obtain accurate statistics in regard to the severity of croupous pneumonia, because of the very different effects which it produces in different individuals.

Attention has already been called to the fact that in early life it is usually not a grave disease, and that in advanced life it is exceedingly fatal. In those who are prematurely aged because of degenerative changes in the cardio-vascular system the effects of pneumonia are as serious as in those who have actually lived for three-score years. In other words, in no disease does the personal equation so largely govern the treatment which should be instituted and so greatly control the results to be obtained by skilful treatment.

Again, in two persons of the same age, in perfect health, who are taken sick simultaneously with croupous pneumonia, it does not follow that they should be treated, even in the early stages of the malady, in an identical manner. Large, highly muscular, full-chested individuals not rarely suffer from pneumonia in its severest forms, and die; whereas, on the other hand, individuals of very moderate muscular development, and slim build, and nervous temperament, when attacked by this malady, frequently survive it.

Many years ago, in the laboratory of Ludwig, in Leipsic, the fact was impressed upon the writer that in different dogs great variations occur in the juiciness of their tissues. The fox-terrier may be taken as a type of a strong and hearty animal, closely knit, with muscles which are not juicy; and, on the other hand, the Newfoundland dog is a type in which the muscles, though strong, are nevertheless soft

and juicy. Similar individuals are met with amongst human beings. In individuals in perfect health and strong in the muscular sense, yet of the full-blooded Newfoundland type, an infectious disease like croupous pneumonia often produces the most serious results, while in the other type the micro-organisms do not seem to find fluids which are so favorable to their multiplication and growth in the wiry and closely knit individuals.

It is stated by Hector Mackenzie, whose article already has been quoted from the *Practitioner,* that alcoholism does not seem to very materially increase the susceptibility to pneumonia, and it is well known that Dickinson has brought forward facts to show that alcoholic persons are less liable to croupous pneumonia than others. This view of the question is certainly antagonistic to that which is generally held by most practitioners, for we all know that pneumonia is one of the most frequent and common complications following the excessive use of alcohol. On the other hand, it is not to be forgotten that the pneumonia most frequently met with in alcoholism is of the catarrhal type, or, more commonly still, a hypostatic pneumonia, due to failure of the right side of the heart and consequent stasis in the lungs. Mackenzie's statistics demonstrate what we already know, that alcoholism diminishes the chances of recovery from pneumonia in almost every instance.

Among the diseases which distinctly increase susceptibility is chronic Bright's disease, which is perhaps one of the most common predisposing causes. Bamberger found that 12 per cent. of a large series of cases of Bright's disease were affected with pneumonia, and the same percentage held good at St. Thomas's Hospital, London.

Another factor which must be taken into consideration in the treatment of pneumonia is the existence of complications. Undoubtedly, pericarditis is an extremely grave complication, and occurs in about 12 per cent. of the fatal cases. So, too, renal lesions developing as acute nephritis in the course of the pneumonia, or as exacerbation of a slight chronic renal affection, immensely increase the gravity of the situation.

In other words, we may sum up this matter with the statement that in this, as in many other infectious diseases, the treatment, if rational, must be exceedingly varied.

With these brief remarks I pass on to a consideration of the various methods of treatment which may be employed, first prefacing what there is to say by the remark that what has just been said is not because I am pessimistic in regard to therapy in pneumonia, but because the proper way to practise medicine is to recognize one's limitations rather than to be carried away by therapeutic optimism.

Dividing the disease into three stages, what are the means we can

employ in the stage of onset? No sooner do we enter this field than we are met with the question of the so-called abortivé treatment by the use of bleeding or circulatory sedatives, such as aconite or veratrum viride. It is evident at once that at the best few patients can receive this treatment, because only a few have a sufficiently bounding circulation to justify its use, and very few are seen by the physician early enough in the malady to be benefited by it—that is, they come under observation after the acute hyperæmia and congestion of onset have been followed by exudation.

Let us suppose, however, that the patient has a bounding pulse and is seen with symptoms which promise pneumonia—that is, a chill, a fever, a pain in the chest, an expression of anxiety, oppression, and some cough; that his general state is sthenic, as it is apt to be in a strong, hearty man; and that auscultation reveals harsh breathing and slight impairment of resonance in one spot. Shall we resort to sedative measures, and, if so, what ones?

In reply to this question the answer would be, Yes; employ sedatives actively and briefly. In other words, use a hot foot-bath, a hot compress over the chest where it is involved, or if the fever is high a cold compress, renewing the compress often enough to maintain its primary temperature. One may give veratrum viride in 3-minim doses of the tincture every fifteen minutes until three doses are given, or the patient's relaxed pulse and slightly moist skin show its effects, and some Dover's powder may be added to allay painful cough and increase diaphoresis. At this very early period such treatment may do much to limit the disease, or at least mitigate its severity, and eventually we may find that such treatment instituted by our forefathers and designed, to use their expression, "to break forming diseases," did break them, and perhaps did so by producing a leucocytosis or phagocytosis, or a development of vital activity which further studies will reveal. Beyond the first twelve hours this treatment should not be carried out, for if not effective by that time the disease has progressed too far for such measures to do good. From this point our effort must be to guide the patient through the storm.

Before proceeding to the treatment in the developed stage of the disease the question of the use of venesection in the early stage may be discussed. While venesection is often valuable later on, it seems an unnecessarily rigorous treatment at this early period, and deprives the patient of valuable blood should he be exhausted by the progress of the disease. The effect of the sedatives named is fleeting and easily overcome by stimulants if it is so desired; whereas the effect of bleeding is prolonged and in one sense permanent. No depressing treatment is ever to be employed in feeble or asthenic patients.

When consolidation has taken place it would seem that there are

four different conditions to be looked after: First, the prevention of hyperpyrexia by cold sponging with friction, the use of an ice-bag over the heart and one to the head. These local applications are of great value in those cases in which the temperature is dangerously high. By the use of the ice-bag to the head pain is diminished, the mind is kept clear, and temperature is to some extent controlled. On the other hand, the presence of fever in a short-lived malady such as croupous pneumonia has not the harmfulness of high temperature in a prolonged illness like typhoid fever, and therefore it does not require the attention and require the use of antipyretic measures to the same degree.

The studies of the Klemperers in connection with pneumonia are in this connection most interesting, for by the injection of the products of the micrococcus lanceolatus into animals they were able to render the animals immune to infection by the organisms themselves, although these organisms continued present in an unchanged form as numerous as ever. In other words, they caused a development of antitoxin in the tissues which enabled the animals to resist the toxin of the germs. More important than this, however, is the fact that the immunizing power of the toxin was found to be very much increased when the latter was subjected to a temperature higher than the normal temperature of the animal before being injected. Thus if heated to about 106° F. for some time previous to injection the immunity was much more rapidly produced than when cooler injections were made, immunity being reached in a few days in one case and not for fourteen days in the other, and then only after large amounts had been given. Further than this, if previously heated toxin is introduced into the circulation the systemic reaction is slight, whereas if the toxin is not heated the systemic reaction is far greater.

The Klemperers think, and it seems to me with good reason, that the object of this high fever following immunizing injections is to produce similar effects to those obtained by heating the toxin before injection; or, in other words, that fever in some way aids the body in acquiring immunity by the formation of antitoxin; and this is proved by the fact that days are required for the production of immunity by toxin injections, but instant immunity is attained if serum from an already immunized animal be injected, for in it the antitoxin is already present. The Klemperers assert that the development of crisis in croupous pneumonia occurs at the time when the body has produced sufficient antitoxin to antidote the toxin; and if fever has no connection with the process of immunization it is curious that the fall of temperature and completion of the immunizing process should occur simultaneously. It is also interesting to note that croupous pneumonia while it usually has its crisis about the eighth or ninth

day, may have it as early as the third or fourth. In other words, the individual attacked develops immunity by the making of antitoxin so rapidly that the poison of the disease is antidoted by the fourth day.

The use of antipyretic measures is only to be resorted to in cases in which the fever is excessive; and, if employed, only those are to be used which reduce the fever moderately and either increase the ability of the system to antagonize the infection or at least do not hinder it from doing so. For these last reasons antipyretic drugs should very rarely be used for the purpose of reducing the fever, for they not only remove fever, but at the same time depress the nervous centers governing heat-production and increase the work of the emunctories already loaded down by the poison brought to them for elimination; and, more important than all, to those who believe in phagocytosis, they arrest the development of leucocytosis and thereby remove one of the means of destroying the germs of disease (according to one theory) or of developing antitoxin (according to another). I am well aware that there is contradictory evidence in regard to the view that the coal-tar products inhibit leucocytosis; but I believe that any evidence against this statement can be set aside in view of the fact that moderate variations in the number of leucocytes take place with or without the effect of drugs or infection. Further than this, authorities can be quoted showing that the use of antipyretic drugs increases the fatal tendency of an infection.

The studies of Jacubowitsch, Muller, and others prove very conclusively that antipyrin at least greatly decreases the elimination of urea by the urine, and the first-named writer vehemently condemns its use for this reason. It also decreases urinary flow, which is a distinctly harmful effect when we wish the excretion of effete materials from the body. (For the reasons for these views see the article on Typhoid Fever.)

Another point of interest is the value of cold applied to the chest. I believe that an ice-bag is of great value in many cases of pneumonia of the croupous type used for two purposes. In the first place, when applied over the heart it is an excellent cardiac sedative. Whether it acts directly or indirectly is not surely known; but the fact remains that under its influence the action of the heart, which is often rapid and difficult, seems to become slower and better in character. Again, in these cases it has seemed that the use of cold to the pericardium has oftentimes enabled digitalis to do good when without the cold it failed to act. Finally, an ice-bag applied over the præcordium aids in preventing that serious complication of croupous pneumonia, pericarditis.

The second value of the ice-bag is for its effect upon the local

processes in the affected lung. In strong, hearty individuals with high fever an ice-bag applied to the chest over the part involved is certainly useful in many patients both for its local effect and because it aids in lowering the fever. It should never be used long enough to chill the patient; but, on the other hand, while the fever remains above 101° F. it may be and should be used incessantly in this class of cases. If the patient is feeble, it is best not to employ it.

Some years ago it was customary to apply hot poultices to the chest on the affected side largely because the disease was supposed to be due to "catching cold." The hot poultice may affect, in a reflex manner, the vessels of the lung; but it is difficult to keep the poultices hot, they are dirty, there is danger of exposure when they are removed, and, lastly, they help maintain the fever and are hot and uncomfortable to a patient already short of breath.

The "cotton jacket," introduced as a substitute for the poultice, is also less popular than formerly and for equally good reasons. If it has any useful function, it is in the catarrhal pneumonia of children.

In many cases of croupous pneumonia it is essential that the patient shall have rest, and this can always be obtained by the use of morphine hypodermically. It is not necessary or proper to give this drug to produce sleep in many cases, but the physician should always ask how much the patient is sleeping, and if insomnia is present it is surprising how much good will follow a period of quiet sleep. The need of rest should be recognized whenever persistent delirium is present, since if it is constant it speedily produces nervous and cardiac exhaustion. Again, in cases without delirium, who lie awake for hours, who often develop a rapid pulse, rather from loss of sleep than from the disease, morphine in the dose of $\frac{1}{8}$ to $\frac{1}{6}$ grain, given hypodermically, is not to be forgotten. Often combining $\frac{1}{200}$ grain of nitroglycerin with it will be advantageous to prevent any after-depressant influence. When we stop to consider how undone is a man in perfect health who has missed sleep for several nights, we can gain an idea of how evil an effect lack of sleep may produce in the pneumonia patient.

There are still numerous minor and major points to be considered in regard to the therapy of this disease. The first of these must deal with the pain often felt in the chest, particularly if in association with the pneumonitis there is a pleuritis. The local use of cold, as just spoken of, may be employed for the relief of the pain, and in many instances from 5 to 10 grains of Dover's powder, or a small amount ($\frac{1}{8}$ to $\frac{1}{6}$ grain) of morphine by the mouth or hypodermic needle is advisable. Such a line of treatment is not to be used unless the pain is really severe enough to be a very distinct factor in increasing

the patient's wretchedness. In other instances, if the pain seems largely pleuritic and considerably aggravated by the respiratory movements, the affected side should be strapped, as it is in ordinary acute pleurisy, by means of overlapping adhesive strips which should extend from the spine to the sternum.

Delirium is best controlled by moderating the fever by the use of cold to the head, and to the body in general if need be, in the form of the sponge bath with friction, and by the use of the bromides or the hypodermic injection of morphine. If the delirium is moderate, it needs no treatment; it is only when it is so persistent as to exhaust the patient or so violent as to cause him to expend his energies in struggles that it need be interfered with. The bromides and morphine are better than chloral because they do not depress the heart.

Another point of great importance in pneumonia, as in all infectious fevers, is to see that the elimination of toxic matters through the bowels and the kidneys takes place freely. Care should be taken that constipation be not allowed to exist, and that sufficient water is swallowed each day to permit free urinary flow. If this does not cause free urination, then both for the sake of the heart, respiration, and kidneys small doses, say, 1 to 2 grains, of caffeine should be given twice or thrice a day.

Another indication is to aid the circulation, *if it needs it.* If one is worried about a patient and is tempted to give stimulants, and before doing so he feels his own pulse, he will sometimes be surprised to find that his own is the weaker, or rather the patient's heart is over-working and really needs no stimulation, but sedation by means of the ice-bag. If the pulse does really need stimulation, what drugs shall we turn to? For years we have looked upon digitalis as the standby; but I believe that it often fails because of the well-known fact that it loses much of its regulating power over the heart in the presence of high fever. Often we fail to get good results from its use until the fever is reduced by hydrotherapy or cold has been applied locally over the heart, when it at once acts most efficiently. It is in the cases of pneumonia in which the symptoms are those of circulatory embarrassment rather than of profound toxæmia, that digitalis is to be regarded as a standard remedy, for in these cases difficulty is experienced by the heart in driving the blood through the pulmonary circulation, and digitalis supports the failing right ventricle. If there is great venous stasis, digitalis cannot be expected to act successfully unless this engorgement is relieved by venesection. The question of the dose is as important as the choice of the drug itself. Surely digitalis is given wrongly in many cases, for the doses are too large and too often repeated. The drug is so slow in its effects that in pressing cases 10 to 20 minims of the tincture, or 1 to 5 minims

of a physiologically tested and standardized normal liquid digitalis, may be given hypodermically; and there is no necessity of repeating it for many hours, say for eight or ten, or even for twenty-four hours in some cases. A far better preparation of digitalis than the tincture for hypodermic use has recently been put upon the market under the name of "digitalis aseptic." This preparation contains all the active ingredients of digitalis, is tested physiologically in order to determine its actual value, and can be depended upon. Its dose is from 5 to 20 minims. By giving a good-sized dose when really needed, and remembering that the effect of digitalis is very prolonged, we provide cardiac support for hours and avoid producing the shuttle-like pulse of overdoses of digitalis. The next important thing is to be sure of the quality of the digitalis, for much of it is so different in effect from what it should be that the desire of the physician may be nullified by a poor drug.

If the pulse be gaseous and relaxed, belladonna in 5- to 10-minim doses every four or five hours may be useful, particularly if the skin is relaxed. In other cases, if the circulatory condition is pressing atropine should be used hypodermically for its stimulant effect on the vaso-motor system.

I am convinced that the importance of considering the condition of the vaso-motor system in disease is not appreciated. Either it is ignored entirely, or it is spoken of indefinitely in much the same way that some practitioners refer to the sympathetic system as the cause of an ailment, probably because it is the simplest way of admitting that they do not know what they are talking about. In reality we may, in view of our knowledge of the functions of the vaso-motor system, assert that its integrity is as necessary to life as is the integrity of the heart—the organ to which we pay so much attention in every case we see. A heart may be lamed, yet the man live comfortably; whereas an ill-conditioned vaso-motor system will at once cause distress. This system is made up on the one hand of the vaso-motor nervous apparatus, and on the other of the blood-vessels themselves.

It is to be remembered that the tonicity of the arterioles and capillaries offers a resistance to the action of the heart which is as natural as is the atmospheric pressure of fifteen pounds to the square inch on our bodies or in our lungs, and that any variation in this resistance by reason of dilatation or contraction of the blood-vessels is followed by as definite symptoms as ensue when we expose ourselves to rarefied air on the one hand, or to compressed air on the other. The resistance offered to the heart by the properly acting vaso-motor nervous system, through its influence on the vessels, is identical with the friction offered to the driving-wheels of a loco-

motive. The locomotive is meant to meet and stand this resistance, and if the resistance is removed by slippery rails the wheels fly around ineffectually, racking the machinery and destroying its usefulness. On the other hand, if the hill be too steep the resistance is too great, and the engine comes to a standstill or blows out a cylinder-head, though before such a thing occurs the mechanism is much embarrassed, as is evidenced by the heaving impulses of the draught.

From this we learn some important diagnostic and therapeutic facts: first, that a rapid pulse may be due in no way to a disordered heart, but be due to vaso-motor relaxation; and, second, that the proper way of treating the rapid pulse is to put sand on the track and increase the resistance, and not to make more steam—or give digitalis—which will only make the engine, or heart, work away on slippery rails with more wear and tear and make no progress.

Conversely, if a heart seems to be laboring against a high arterial pressure, the most sensible thing for us to do is not to stimulate this organ to increased and exhausting effort, but to eliminate the resistance offered by the grade, by making a cut through which the heart may pump its way with normal resistance. This we do by the use of vaso-motor relaxants, such as the nitrites, or by bleeding. Much of the reputation of nitroglycerin as a cardiac stimulant rests on the fact that under its influence excessive arterial resistance is removed and the heart has a chance to perform its work properly without direct stimulation.

When we consider the enormous space offered by the capillary area when it is relaxed, for the flow of blood or its stagnation, the facts I am endeavoring to emphasize become even more impressive.

It seems proper, therefore, that in every case to which we are called we should examine the tension of the bloodvessels before prescribing for the heart itself.

Let us take for study severally conditions familiar to us all, in which the heart is in reality intact and the vaso-motor system really at fault, yet in which the heart usually gets the credit for the trouble. The most frequent of these is ordinary shock, in which, after the early inhibition of the heart by the irritated vagus (a state we rarely see, because we do not see the patient soon enough), the entire group of symptoms indicates vaso-motor relaxation in the soft radial pulse, the cold, wet, leaky skin, and the bloodless surface. Under these circumstances the heart beats fast and abortively to fill the yawning blood-paths, which have many times the area it is capable of filling, and soon fails from exhaustion. Another state more like that of shock than those just named is the vaso-motor relaxation of advanced acute diseases, such as pneumonia. Every physician must have seen

cases of pneumonia in which, after the crisis, there developed a rapid running pulse with collapse and profuse sweating, with gasping breathing. Undoubtedly this state is partly due to the heart being exhausted by its work, and the loss of its stimulation caused by fever, but a large part of the symptoms are really due to the vaso-motor relaxation.

There is no drug so much employed in pneumonia as strychnine, and I think few are so often employed without good reason. Stimulants are of four classes: either they act by providing the system with material which in its combustion adds force to the body, as does alcohol, or they supply the parts called upon by their action with increased quantities of blood, as does digitalis; they liberate reserve force and enable the individual to put forth greater strength for a time, as does coca; and, finally, they may act as whips or irritants to the nervous system, as does strychnine. Strychnine is therefore the only one of these which simply goads the system to increased endeavor and does not aid it simultaneously. By giving it freely when the patient seems to be sinking into the slough of death we may rally him to a final effort to pull through, just as the crack of the whip will prevent a team being "mired"; but the skilful driver does not lash his horses all day long, and keep on lashing them after they are stalled. He uses it heroically at the crucial moment. Strychnine puts "a wire edge" on the nervous system, and if its use is kept up in full doses causes more harm than good. For prolonged collapse or tendency thereto, we may resort to coca wine. For combating a sudden collapse, strychnine is invaluable, particularly if it be combined with atropine.

It is needless to add that a fine old brandy will often agree very well with patients who have a feeble circulation, particularly if they are advanced in years, and young children, who do not stand the use of digitalis well, as a rule often do better under alcoholic stimulation than they do under the carbonate of ammonium. It is not to be forgotten, however, that alcohol is often greatly abused in the treatment of this disease, and that it should only be used when there is distinct need of some drug to support the circulatory apparatus. Alcohol probably does best in those cases which from the very first manifest signs of exhaustion and a tendency to collapse.

There is still another drug greatly abused in the therapy of pneumonia, namely, quinine. There can be no doubt that when used in small doses it will exercise in some individuals a supportant influence, but its use in massive doses, such as are sometimes used, is useless, and only serves to increase headache at the same time that it tends to congest the kidneys. It certainly does not exercise any specific effect on the microörganism of the disease or the progress of the malady.

Nitroglycerin is another drug which is very often wrongly employed in pneumonia, being used perhaps more because some prominent physician has recommended it than with any very definite idea why it is given.

A very important paper has recently been published in the *Therapeutic Gazette* by Dr. Elsner, of Syracuse, dealing with this subject. In this communication he emphasizes the fact that in nearly all infectious diseases the condition of the vascular system is one of relaxation. This clinical fact has been recognized in this country before, and has been the subject of careful study abroad both in the laboratory and at the bedside. It is evident, therefore, that on general principles there is little need of vascular relaxants and not a little need of vascular stimulants in the largest proportion of cases of pneumonia.

The value of nitroglycerin in this disease seems to me to be in direct proportion to the degree of arterial tension. If this be high, this drug is, of course, invaluable; if it be low, it is manifestly useless; and should venous engorgement be great it is only a very indirect means of producing relief when a much better and more direct means is venesection.

The value of oxygen gas is problematical. I always use it if respiration is difficult, and it nearly always seems to make the patient more comfortable, partly by the mental effect, perhaps. I have never seen a patient who needed it badly who could take it himself in the sense of holding the tube to his mouth or to his nose. He has too much "*luft-hunger*" to aid himself, and it must be held for him.

The patient having reached the stage of resolution, as a rule little need be done for him beyond good nursing, absolute rest in bed, and nutritious feeding. All these non-medicinal aids are really more important than they are commonly considered. The careful nursing prevents imprudences in movement, exposure, and in diet, and also prevents well-meaning visitors from tiring the patient. The absolute rest is necessary, not only for the conservation of the patient's energies, but also because in all severe infectious diseases the heart should be permitted to recover from the stress of the malady before it is called upon to perform extra labor, and the easily digested and nutritious diet is needful to aid the patient toward convalescence. The importance of letting the heart recuperate is often overlooked, and the patient is left with a state of cardiac weakness which lasts for many weeks.

In regard to the use of expectorants, it may be said that as a rule they are not needed in the later stages of croupous pneumonia, for the exudate is not one readily affected by such drugs. Where the process of resolution is slow it is better hurried by improving the

patient's general health by good food and tonics than by the use of such resolvents as iodide of potassium. Indeed, a prolonged period of resolution should always make the physician suspicious of there being a possible tuberculous infection present.

There is still to be considered while discussing the treatment of croupous pneumonia the question of anti-pneumotoxin. Such a plan of treatment has been before the profession for several years, and, to sum up the question, has not proved a success. It is still emphatically in the hypothetical or experimental stage, and does not give results which up to the present writing justify the physician in using it.

In the feeding of the patient suffering from croupous pneumonia a very light diet should be employed. Solids should be avoided, the food given often in small amounts, with or without some accompanying stimulant, and only those liquid or semi-liquid foods which are easy of digestion are to be allowed. It is of great importance that large amounts of food and drink be not given, as sufficient quantities to distend the stomach and produce pressure upon the heart, directly or indirectly, may cause serious cardiac embarrassment. Indeed, I have seen not only alarming symptoms, but death from heart-failure occur as a result, apparently, of the patient overloading the stomach with a large amount of buttermilk taken at one time.

If there is a tendency to tympanitic distention, which of itself in this disease is of rather serious import, it should be combated by the use of turpentine stupes, the rectal injection of a pint of milk of asafœtida, and by taking milk out of the diet-list, because a milk-diet favors the development of flatus. In some cases the tympanites, if marked, disturbs the heart's action sufficiently to cause serious embarrassment in its work.

Our increasing knowledge in regard to the infectious character of croupous pneumonia indicates that it is important for us to forbid persons who have lungs impaired in vital resistance from entering the room of the patient who may be suffering from this disease. While there is not, of course, the same degree of danger that would exist in the case of one of the ordinary eruptive diseases, such as scarlet fever, there can be no doubt that it is perfectly possible for one individual to contract pneumonia from another, and no trained nurse or member of the family who is not in good health should be permitted to associate with the patient for this reason. Further than this, as the microörganism of croupous pneumonia is found in the sputum in very large numbers, this sputum should always be carefully disinfected for the same reasons that we disinfect the sputum of a tubercular patient.

If the sputum becomes dried and so gains access to the respiratory

passages in the air that is breathed, it naturally produces a second case of the disease. The best disinfectant solution for the destruction of this microörganism is a 5 per cent. solution of carbolic acid or a 1 : 1000 solution of corrosive sublimate. In either case the solution should be colored with methyl-blue or indigo, in order that it may not be taken by mistake as a drink; and the spit-cup should be of such peculiar form and shape that it cannot readily be confused with the vessels placed upon the patient's table and from which he is expected to drink.

I have not attempted to present an exhaustive bibliographical article, but one which is purely clinical; and in closing I cannot do better than reassert the fact already stated, that in no disease does the welfare of the patient depend more upon the skill, ability, bearing, and discretion of the physician than in this, and that nothing is more fallacious than that such cases can be treated by any routine method. The curse of therapeutics to-day is the fact that physicians do not think for themselves, but blindly follow some method seemingly valuable, so that the personal equation of the individual is lost in the sum total of the disease. No one plan can invariably be followed, for the doctor is not treating a disease, but an individual afflicted by an infection which will vary in its effects according to his susceptibility and the virulence of the invading microörganism.

CATARRHAL PNEUMONIA.

Much that has been said in regard to the treatment of croupous pneumonia applies with equal force to the therapy of the catarrhal form. In a large proportion of cases, however, this disease comes on as a secondary process, attacking an individual who is already weakened by some previous malady. In the great majority of cases, therefore, from the very beginning of an attack of catarrhal pneumonia it is necessary for us to supply active supportant treatment and proper stimulants. Further than this, it is to be remembered that the disease is one which does not run a definite course and end by crisis, as does croupous pneumonia, but very frequently continues on for a considerable period of time, thereby still further exhausting the patient. It is particularly apt to come during illnesses affecting persons well advanced in years and in young children, and in both these classes of patients it is often disastrous in its results. This disease is very frequently met with as a sequence of severe primary bronchitis, following whooping-cough, measles, and sometimes scarlet fever. It also may occur in the course of typhoid fever and diph-

theria, or even in erysipelas, and now and then is met with in the form of aspiration-pneumonia following the employment of one of the anæsthetics, more commonly ether. In still other instances the bronchopneumonia, or catarrhal pneumonia, as it is sometimes called, is really the early stage of a tubercular process, and depends entirely upon tubercular infection.

The preventive methods which may be instituted against the development of catarrhal pneumonia are those which are dictated by ordinary prudence. Children and old persons suffering already from inflammatory processes in the respiratory passages, should be kept indoors in bad weather, and should be prevented from doing imprudent acts. It is more important in this disease than in croupous pneumonia that the room in which the patient lives shall be at a moderate temperature, and on certain occasions that the air of the room shall be moistened by the slight escape of steam from a kettle of boiling water. So far as local treatment is concerned, there can be no doubt that the employment of counter-irritant substances in the form of liniments or by applying blisters is sometimes useful in the early stages of the disease or in limiting its development, or, after it has once developed, in preventing its spread. I do not believe, however, that the chest poultice or the cotton jacket are of any greater value in the treatment of catarrhal pneumonia than they are in the treatment of croupous pneumonia; and it will be remembered that I have already stated that I thought patients got along as well, if not better, without them in the latter disease. In this form of pneumonia, too, the patient's temperature should be controlled by cold sponging, or by cleansing with tepid water if the temperature is not high, and usually yields readily to this form of antipyretic measure; and in this disease even more than in croupous pneumonia the employment of the coal-tar antipyretics is distinctly inadvisable and exercises an evil influence upon the patient. I cannot protest too strongly against their employment.

On the other hand, nearly every case of catarrhal pneumonia requires more or less active stimulation at different times during the attack. By this I do not mean to intimate that every case of catarrhal pneumonia should receive alcohol or other stimulants. Each individual is a law unto himself, and if he does not need circulatory stimulants they should not be employed. In the catarrhal pneumonia of children there can be no doubt that small doses of alcohol in the form of old whiskey or old brandy are very frequently most efficacious. Twenty or thirty drops of brandy given diluted with water to a child of two or three years every two or three hours for one or two days will very frequently produce marked improvement in the circulatory symptoms, and it is better, as a rule,

to produce these stimulant changes gradually than to produce them suddenly by the administration of full doses in somewhat concentrated form.

Another valuable remedy in this condition, particularly in children, is the carbonate of ammonium, given in a dose of 2 to 3 grains every three or four hours with acacia and water. Strychnine may be employed if there seems to be a tendency to cyanosis and collapse, but it should be reserved for the more desperate conditions as a rule, and I do not think should be employed as the ordinary stimulant in place of alcohol. If it is so used for any period of time, it is very apt to produce a condition of nervous excitation and rapid pulse which is distinctly alarming in its character, although it is probably not so dangerous as it seems. So, too, it has seemed that digitalis does not act as well in catarrhal pneumonia in children as it does in adults. In those cases in which the inflammation seems to extend down into the capillary bronchial tubes, producing a condition which at one time was called "capillary bronchitis," there is no doubt that strychnine is a very valuable stimulant and ought to be given freely, preferably hypodermically, to stimulate the system to increased endeavor. So too, it is often wise to combine with the strychnine moderate doses of atropine, for the atropine very distinctly decreases the rapidity of the secretion into the smaller bronchial tubes and thereby directly relieves, or rather prevents, cyanosis and interference with respiration produced by over-secretion. Where the heart is laboring and the arterial tension seems somewhat high, nitroglycerin is, of course, to be employed. In children as much as $\frac{1}{300}$ of a grain may be given every four or six hours. In adults it is usually useless to administer less than $\frac{1}{100}$ of a grain.

Should the symptoms dyspnœa and cyanosis become very manifest, particularly if these symptoms occur in childhood, there can be no doubt that life can be saved by use of the alternate hot and cold douche, or by use of the alternate hot and cold bath. The child, having been stripped, is lifted from its bed and is immersed in a tub of water which is so hot that it produces distinct irritation of the surface of the body without doing the skin any real damage. After the child has been in the water for a few moments and has become accustomed to its temperature, it is lifted from this tub and immersed in another in which the water is about 70° F., or even colder. In a few seconds it is removed from the cold water and reimmersed in the hot. These powerful alternate stimulations of the peripheral sensory nerves cause wide dilatations of the peripheral capillaries, so that the surface of the child's body, which had been marbled or mottled in appearance, becomes evenly red and even distinctly hyperæmic, and with the development of cutaneous hyperæmia the evidences of engorgement

of the respiratory organs and of labor on the part of the heart often disappear. We have more than once seen the employment of cold water in this manner in apparently desperate cases of capillary bronchitis or catarrhal pneumonia in young children produce the most gratifying results. It is hardly necessary to point out that the child should not be allowed to remain in the cold water long enough to be chilled, nor in the hot water long enough to have its temperature distinctly raised, although there is less danger while it is in the warm water than while it is in the cold. Not only does this alternate hot and cold application seem to relieve the engorged and laboring circulatory system, but it also very frequently, by stimulating the child and waking its system to the needs of the respiratory apparatus, results in a violent spell of coughing, which speedily rids at least the upper bronchial tubes of the secretion which has formed in them. It is practically impossible, at least in private practice, to use baths of this character for adults. The contact of heat and cold to the skin can, however, be produced by the use of large wet compresses, which can be laid upon the chest posteriorly, anteriorly, or laterally and alternately. A valuable adjuvant to this form of treatment, when the capillary circulation seems to be seriously impaired, is the use of that most rapidly acting, diffusible stimulant, Hoffmann's anodyne. There can be no doubt that in a dose of 10 or 20 drops to a child in a little cold water, or 1 or 2 drachms to an adult, it is a valuable, rapidly acting respiratory and cardiac stimulant.

In discussing the treatment of croupous pneumonia, I pointed out that the administration of expectorants in this disease was almost useless, chiefly because the condition of the bronchial membrane is not one in which mucous secretion takes place. An exactly opposite condition exists in catarrhal pneumonia. In this disease there can be no doubt whatever that it is our duty to administer expectorants which will not only support the circulation, but which will also cause a free expectoration of the secretions which are clogging the bronchial tubes. Of these expectorants, there is probably nothing better than the chloride of ammonium given to a child in the dose of 2 or 3 grains every three or four hours, or to an adult in the dose of 5 or 10 grains every three or four hours, with a drachm of fluid extract of licorice and a drachm of distilled water. If the cough is excessive, it is wise to add to this prescription some codeine or heroin. As a rule, those expectorants which are stimulating in character are not needed in the early stages of the disease, but are to be employed after the chief danger is passed by, and when we are anxious that the lungs shall rid themselves of the accumulated secretion. In the early stages of bronchopneumonia, when there are much inflammation and little peribronchial extravasation, these expectorants cannot, of course,

prove of very material value. Indeed, there is reason to believe that their use at this time is distinctly deleterious; nor are they of much value after the extravasation has taken place and before the advanced stage of the disease has thoroughly developed. They are to be employed to clear up the wreckage rather than to prevent its development, because bronchopneumonia is so frequently tubercular in origin, and also because it is a state in which tubercular infection readily takes place.

Cases of catarrhal pneumonia which do not undergo resolution within a period of two weeks after the beginning of the attack should always be regarded with a suspicion of tuberculosis. The number of cases of tuberculosis which develop subsequent to an attack of catarrhal pneumonia is very considerable, and, therefore, in many instances, as soon as patients are able to travel it is wise to remove them from the city, if that is where they are living, and send them to some place where they will breathe plenty of fresh air, and where they will also get sunshine and an outdoor life. Should the impairment of resonance in the area which is affected maintain, the patient should be sent to some high altitude where he will get the characteristic increase in hemoglobin which is found in the blood of persons residing in high altitudes, and will also take the respiratory exercise which is forced upon him by the rarefied air. Colorado Springs, or some other point, with a similar altitude of 5000 or 6000 feet, is the type of a place to which such a patient should be sent, unless it be in the middle of winter, when the exposure to extreme cold may be thought inadvisable. Under these circumstances it would be proper to send the patient, if he is very delicate and seems to be susceptible to cold, to some warm and balmy climate, such as is to be found at Palm Beach, Florida, or San Diego, California; or, if he can still stand cold, and a very high altitude is not considered wise, he may be sent to Thomasville, Ga., which has an altitude of less than 1000 feet; to Asheville, which has an altitude of between 2000 and 3000 feet; or if a sea-level is required in the northern part of the country he may be sent to Lakewood, N. J., where the sandy soil and the presence of pines produce a condition of the atmosphere which is exceedingly favorable to patients suffering from bronchial and pulmonary irritations, either with or without the history of an attack of catarrhal pneumonia.

For the purpose of aiding in the resolution of the exudations of catarrhal pneumonia some practitioners have been in the habit of administering iodide of potassium. There can be no doubt that this drug exercises a powerful influence upon the exudations of this disease. But, on the other hand, it is a well-known clinical fact that in tuberculosis of the lungs it frequently causes a rapid breaking

down of the tubercular masses, and thereby makes the patient rapidly worse. Indeed, some practitioners have actually proposed that in cases of doubtful pulmonary tubercular infection iodide of potassium or iodide of sodium should be given with the object of seeing whether it would produce a favorable or unfavorable effect. If it produces a favorable effect, it is to be considered that the attack is one of ordinary catarrhal pneumonia without tubercular infection; whereas, if under the administration of these drugs the area in the lungs seem to be unfavorably affected, it may then be considered that the cause of the continued illness is the presence of the tubercle bacillus.

In the treatment of catarrhal pneumonia the practitioner should pay careful attention to the diet of the patient, as the condition is usually developed by those who have been exhausted by some other illness, and the patient is manifestly in greater need of supporting treatment than in the croupous form of the disease. Food should be given very frequently—every two or three hours—in small quantities, so that the digestion at no time will be overloaded, and yet so constantly and frequently that the patient receives active support from the beginning to the end of the illness. Should the digestive apparatus be out of order, any attempt at the administration of supporting diet should be preceded by the administration of a light calomel purge, and if it need be it can be followed by a saline cathartic, such as Seidlitz powder, citrate of magnesium, or Hunyadi water. Active purgation weakens the patient's resistance, and, of course, should be carefully avoided.

Additional remedies which are of value for the purpose of overcoming the asthenia and anæmia which exist after the disease has passed by are iron and arsenic, given in the well-known formula for a pill containing these drugs. Often, too, it is advantageous to apply iodine in the form of a tincture in a black coat over that portion of the lungs which seems still to be somewhat impaired in its activity.

ASTHMA, BRONCHITIS, AND WHOOPING COUGH.

By NORMAN BRIDGE, M. D.

ASTHMA.

Asthma is a symptom-complex of some inducing pathological state; rather of two or more such states depending on each other. Objectively and subjectively, it is a struggle of more or less severity to force air into and out of the chest. Other symptoms sometimes occur in addition, but these are the primary and essential ones. The smaller bronchi are in some way reduced in diameter or have their lumen reduced, and several theories have been invoked to explain this phenomenon.

It is this lessening of the air-carrying space within the tubes that mechanically and directly induces the symptoms. But the change in the tubes is the result of some other preceding pathological state or irritation, either in this or some other and perhaps remote part, and which is sometimes undiscoverable. This primary cause is not always the same, but it generally consists in some disorder, disease, or peculiarity of the nervous system. Asthma occurs mostly in paroxysms coming on suddenly, more often in the night, which last perhaps an hour and suddenly subside, or a seizure may develop slowly, and, whether beginning abruptly or gradually, one may last many hours or days with only occasional fluctuations in severity. The suffering and annoyance from the dyspnœa vary from the most trifling discomfort to the most extreme and pitiful struggle for the breath of life, with profuse perspiration, swollen features, and extreme cyanosis, the patient the while sitting or standing with the body bent slightly forward and the clothing about the neck and chest loosened to give fuller action to the muscles.

Other pathological conditions often accompany it, as bronchitis, emphysema, and bronchorrhœa, but fever never attends pure asthma. Emphysema often develops in the chronic form with chronic bronchitis. A pronounced case of emphysema often appears, for obvious reasons, to be one of asthma, when there may be at the moment no

narrowing of the diameter of the bronchi. During an attack the patient is often completely free from any other symptom than the wheezing and laborious breathing, and before and after it he is often perfectly well, so far as can be discovered There is always to be heard in an attack of asthma a wheezing sound, even quite a distance from the patient; and auscultation reveals prolonged expiration of low pitch, with sibilant and moist râles and rhonchi in variable amount. Expiration is often longer than inspiration; always if there is any degree of emphysema. The paroxysm often ends in free expectoration of almost colorless frothy mucus, to be followed perhaps for some days by discharge of a lessened amount of phlegm, but more purulent in character.

Numerous circumstances cause paroxysms of asthma. The most important and wellnigh essential condition is some peculiarity of the nervous system, which for want of a better designation we may call personal idiosyncrasy. It is an excessive susceptibility to slight influences that tend to produce an attack, and leads to paroxysms when no other cause can be discovered, the ordinary conditions of the patient's environment being enough at times to bring one on. The susceptibility fluctuates: at one time the inhaling of the dust emanating from an occupied room will cause an attack, at another only the breathing of some extremely irritating substance is capable of doing it. After all, the personal idiosyncrasy may depend mostly on some inscrutable vice of system, as of the secretory organs, inducing the nervous susceptibility, rather than in any organic state of this system itself. But often a direct causative condition may be found, especially if we search carefully for it. Various irritating substances inspired often produce it, as vegetable or animal dust of certain kinds; dust from old hay or straw, from feather beds and pillows; powder of ipecacuanha and the fumes of tobacco; various gases, as chlorine; the emanations from burning tar and from some kinds of coal, from horses and their stables, henhouses, and animal cages; from certain flowers, as fragrant lilies and the tuberose; and a hundred other things of the most diverse sorts, including the recondite cause of hay-fever.

A more common etiological factor, probably, is some irritation of extra-bronchial organs capable of inducing the asthma by reflex action. Irritation of the nasal passages by polypi, hypertrophy, or some extraneous influence, and hyperæsthesia of these parts, cause many cases, just how large a proportion it is impossible to say, but probably 15 to 20 per cent. at least.

A frequent cause of the disease or its aggravation is a derangement of some part of the digestive system. In many susceptible persons almost any irregularity in diet, over-eating, or the use of

food not easily digested by the particular individual is sure to bring on an attack. Irritation or disease of many other organs may in those predisposed induce the disease; among these are the sexual organs in both sexes, the heart, lungs, the spinal column, the kidneys, and the bladder.

There is some recondite influence in certain localities capable of inducing or relieving the affection, and the places differ to some extent for different patients. Hence changes of residence often relieve, or aggravate if they do not produce the disorder—as going from a moist to a dry atmosphere, from a lower to a higher altitude, or *vice versâ* (and often a few hundred feet will produce a marked change), or from the city to the country or the reverse.

Then, such nervous influences as fear of asthma or of some other calamity, or fright, apprehension, or mental overwork or worry, are capable of inducing true asthmatic seizures in certain persons. But quite a proportion of such seizures, at least much of the so-called nervous asthma, are really only instances of the difficult breathing of laryngeal spasm.

The pathology of asthma has been the subject of much study and considerable disputation. The physiological or anatomical changes that directly induce the symptoms must be capable of sudden occurrence. Muscular spasm in the walls of the bronchi would seem to be a rational theory of such change. Muscular fibres exist in the walls of the small bronchi, which are under the control of the pneumogastric, recurrent laryngeal, and the sympathetic nerves, and it seems to be experimentally proven that by sudden spasmodic contraction they can cause asthmatic breathing. Well-known analogues of such phenomena are the spasm of the glottis, of the sphincters of the bladder, anus, and of the œsophagus. Irritation of the vagi in animals causes contraction of the bronchi and dyspnœa. But it is not necessary to assume that muscular bronchial spasm causes all cases of asthma, nor is it at all likely to be the case. Sudden swelling of the bronchial mucosa can easily create such a narrowing of the air-channels as to make respiration difficult. That such thickening does occur there ought not any longer to be a particle of doubt. A patient will sometimes within a minute after a whiff of some offensive substance find nasal breathing difficult, and in five minutes quite impossible, from sudden swelling of the nasal mucous membrane. Erectile tissue is a name given to parts of this structure to express its capability for sudden and extreme engorgement. Similarly may the bronchial membrane swell.

A meal of shellfish out of condition or at times in perfect condition may within a few minutes, in a susceptible person, cause a marked urticarious swelling of the face, neck, and hands.

Then we have the sudden, startling swelling of the tongue from obscure causes, infrequent but positive, and induced by some cause outside of the oral cavity, probably a reflex of some irritation of the nervous system. It subsides in a few hours regardless of treatment. Localized swellings of the skin and subcutaneous tissue are common enough, and uninduced by renal or cardiac disease or by obstruction to circulation of the part by pressure, and unassociated with any cause of general anasarca. This condition has been aptly called angio-neurotic œdema.

Frequently an attack of asthma that has lasted a number of hours without cough will subside with a cough and profuse bronchorrhœa. It is more rational to suppose such an event following what may be called an angio-neurotic swelling of the bronchial mucous membrane than a spasm of the muscular fibres of the bronchi, whose contraction is confined to reducing the diameter of these tubes. Decidedly the muscular-spasm theory is less supported by the facts than that of angio-neurotic swelling of the bronchial mucosa. Nor can the presence of the somewhat characteristic crystals and spirals in the bronchial mucus in cases of asthma be said to particularly support the theory of bronchial spasm. If the crystals are the active causative irritant, as has been suggested, they unquestionably first harm the mucous membrane, and might more readily cause first the angio-neurotic swelling. But since the crystals have been found in the secretions or products of several other parts of the body, in bronchial mucus in non-asthmatic cases, and even develop in bronchial mucus outside the body, and since the spirals have been found in other diseases, they can scarcely be considered as exercising any powerful influence in causing asthma. They are of value for diagnosis, and search for them should be made in any doubtful case.

Some observations have been recorded which indicate that just before an attack of asthma eosinophile corpuscles of the blood and lymphocytes are considerably increased, to lessen promptly afterward; while the neutrophile cells decrease before and increase after an attack. If these changes should be found to be constant, or nearly so, it would be a most important discovery in the pathology of the disease.

Although asthma from the standpoint of diagnosis is usually a self-evident disorder, it is not unfrequently confounded with other affections. Occasionally a case of suddenly occurring severe dyspnœa of uræmia is mistaken for asthma. There should be no difficulty in making the distinction even from the symptoms, for, unless there is pulmonary œdema and much rattling, the character of the breathing is hardly like that of asthma: it is dyspnœa without evident obstruction, and of course if there is much rattling uræmia should be suspected. There is nearly always in a case of uræmia, bad enough to

produce paroxysms of dyspnœa, some œdema or cachexia, or both. The absence of these should never lead to the exclusion of renal disease in a suspicious case, but the urine should always be examined critically.

The inability to rest in the horizontal posture without more or less difficulty of breathing, due to organic heart disease, has led to a diagnosis of asthma, but this could occur only on a most cursory consideration of the symptoms and signs of any case. The breathing is non-asthmatic, the dyspnœa is aggravated by exercise, and in cases where from dilatation and elongation of the blood-vessels of the lungs and thickening of the connective tissue about them, even with the addition of some œdema, there is embarrassed breathing, the barest history of the case and a touch of the pulse will nearly always tell the nature of the case, and auscultation, which should never be omitted in any chest disorder, will certainly discover the heart-lesion.

Spasm of the laryngeal muscles is often enough mistaken for asthma, but here too a little care should make a diagnosis easy. The obstruction is chiefly of inspiration, which is often loud and stridulous while expiration is noiseless (that of asthma is more of expiration); in severe cases inspiration is attended with great effort, and the wheezing has a loud laryngeal quality quite unlike that of asthma. The ear inclined toward the patient would generally locate the obstruction in the throat rather than in the chest, and auscultation of the chest fails to discover the fine sibilant râles and the low-pitched, prolonged expiration of true asthma. The respiratory sounds are laryngeal, and more like the quality of extreme bronchial, or even tracheal, breathing, never found in pure asthma. All doubt is cleared up by the laryngoscope, but usually the agitation or youth of the patient makes it impossible to use this instrument.

There is a nervous, hysterical dyspnœa supposed to be asthmatic. Sometimes the form is that of laryngeal spasm—laryngismus stridulus; sometimes a dyspnœa with no particular obstruction, and therefore resembling the uræmic form. This nervous form is sometimes brought on by fright, fear, anger, or by over-indulgence in stimulants or brain-poisons of some kind—alcohol, tea, coffee, or tobacco—in which case there is usually some precordial distress or sense of weight, and more fear of suffocation than there is in pure asthma.

Membranous croup is sometimes mistaken for asthma; but here again, the history of the case ought to exclude it, for this form of croup, unlike asthma, comes on slowly and progresses gradually to the severest dyspnœa. It always produces aphonia; asthma never does.

Paralysis of the abductors of the vocal cords allows them to fall together and produce more or less obstruction of inspiration, resem-

bling the laryngeal spasm in symptoms and physical signs. The laryngoscope in these cases shows the cords close together with the slightest opening between them. The inspiration is difficult, the expiration always noiseless.

Tumors of the larynx, trachea, bronchi, and lungs, and rarely contractions of adventitious fibrous tissue in fibroid phthisis, causing pressure upon some of the larger bronchi, sometimes appear to simulate asthma, at least to some extent, for the physical signs resemble more those of spasm of the glottis, and the peculiar bronchial quality of breathing is unlike that of asthma. Besides, the tumor or other causal lesion can usually be demonstrated, and the obstruction from tumor or pressure has come on gradually, almost never with the suddenness of a fit of asthma. It is true that in these several pathological conditions there are occasional paroxysms of more marked obstruction and difficulty of breathing, but they are either due to the superaddition of slight spasm of the glottis or to fright or other emotional demoralization on the part of the patient; and in either case the bronchial quality of the breathing is exaggerated.

The disablement of one lung by extensive pleuritic effusion or empyema, throwing all or most of the labor of respiration on the opposite one, has more than once led to a false diagnosis of asthma. But the most casual study of any such case ought to prevent the error.

Emphysema and chronic bronchitis, which usually occur in combination, offer the chief difficulty in diagnosis in a critical study of asthma. The physical signs are, many of them, the same in the two conditions: there are prolonged, low-pitched expiration, sibilant râles, and labored breathing. But at the same time there is often increased percussion resonance, more or less of the "barrel" form of chest, with a history of chronic bronchitis, and many exacerbations of acute inflammation. Asthma is not infrequently associated with chronic bronchitis, and so is in a measure responsible for the occurrence of emphysema. Emphysema and bronchitis, and the two combined, are gradual in their development, and never have any such history of sudden occurrence of dyspnœa as characterizes every case of asthma. If severe enough to produce dyspnœa, this symptom is rather constant; there is never such sudden cessation of dyspnœa as belongs to all cases of asthma. Such exacerbations as do occur are the gradually developed attacks of acute bronchitis implanted upon the chronic form.

The **prognosis** of asthma is favorable so far as concerns immediate danger in a paroxysm. The patient sometimes looks and acts as if he were about to die, but he does not die. If the seizures are frequent and prolonged, and accompanied by chronic bronchitis,

eventually bringing on emphysema, the patient may be worn out and his life shortened, or he may become so reduced as to succumb to an acute attack of the bronchitis, or some intercurrent affection.

Treatment.

The treatment of asthma should be systematic and rational, not hap-hazard, and a definite course of sequential procedure should be carried out if possible.

Frequently, the case is first seen in the midst of a paroxysm, which demands relief at once. Palliatives must generally be used, but even here a hasty inquiry into the cause may enable one to remove it by an emetic (sulphate of zinc 20 to 40 grains, or Turpeth mineral 1 to 4 grains, or ipecacuanha 10 grains), expelling a quantity of undigested food from the stomach, to the instant relief of the patient; or irritating intestinal contents may be expelled by an enema of the normal salt solution (6 to 1000 solution of sodium chloride); or some baneful influence in the respired atmosphere may be discovered and quickly eliminated; or an irritated nasal mucous membrane may be soothed by the application, on a small probang, of a trifle of a 4 per cent. solution of cocaine or by a simple spray of albolene.

The most simple and generally efficient palliative of an attack, proven by the experience, with or without advice, of unnumbered cases, is the inhalation of the fumes of burning stramonium or potassium nitrate, or the two together. A large number of proprietary preparations of these articles, with various non-essential additions and put up in various forms, have been used with more or less benefit. Many of them contain some balsamic or other aromatic substance capable of producing, besides a pleasant odor, some slight anti-spasmodic effect, but it is safe to say that they all contain one or both of the articles named as their cardinal ingredients. A common domestic compound is made by saturating bibulous paper with a strong solution of saltpetre and the fluid extract of stramonium, and drying it. It burns readily and slowly, and may be used as freely as the patient finds to his advantage. He can hold his face over the burning paper or by the use of a paper funnel concentrate the fumes. Some relief is usually found in a few minutes, but sometimes no benefit is experienced.

The iodide of ethyl is a useful remedy, and may be given cautiously by inhalation; it often gives prompt temporary relief. Chloroform is more promptly efficient, but the relief is evanescent; it requires to be given repeatedly, almost continuously, during an attack. There is danger that if the patient handles it himself he may take too much, may even fall asleep with the open bottle near his face, and fatal narcosis ensue. Ether has nearly the same effect as chloroform, but is

rather less efficient and agreeable. Both drugs are safe in any moderate amount, and should be inhaled in many small and repeated doses. The best way is to press firmly against the open mouth of the bottle a folded napkin, while the bottle is quickly tipped over against it. The cloth will bring away not over 5 to 15 drops, and should be held to the face by the patient himself, who the instant narcosis is even approached will let his hand fall, thus acting as an automatic safeguard against danger. This dose may be repeated as often as necessary. Asthmatic patients are quite tolerant of these drugs, and in the way indicated they may be used for many hours without danger. But at the best they are only a palliative to repress the symptoms until the exciting cause or the greater susceptibility has passed off, and are not known to reduce the frequency of the attacks.

Pyridine is alleged to cut short a paroxysm of asthma when taken by inhalation (a few drops being placed in a saucer and held near the face), and also to cause a freer flow of mucus into the bronchi with a sense of relief. But the odor is so pungent and disagreeable that few patients willingly take it. Inhalations of the nitrite of amyl will sometimes cut short a paroxysm of asthma. The drug should be used with the greatest caution.

The hydrate of chloral is in some cases an efficient remedy for the attack, but is not prophylactic. A large single dose (20 to 30 gr.) is better than several smaller ones, and in a few minutes the relief is usually marked, but sometimes no effect is produced, and the after-symptoms are to a few persons disagreeable. The remedy may be tried if the inhalations are not efficient, but even if it works well and produces no bad after-effects, it should not be used often, for in some people one dose of this drug creates a demand for more.

The nauseants are useful in a paroxysm, especially lobelia, which was more used formerly than now, but these drugs are so disagreeable when carried to the extent of producing marked nausea, which is necessary to have the best effect on the asthma, that patients wisely refuse to take them except as a last resort. A much better class of remedies are the coal-tar analgesic preparations, antipyrin and phenacetin especially, which have real merit and very rarely disagreeable immediate or after-effects. They doubtless act in the same manner as they do in migraine or neuralgia. One rather large dose, 10 or 15 grains (adult), may be taken at the beginning of a paroxysm, and usually need not be repeated. Prompt amelioration is likely to ensue, but sometimes no effect whatever is produced.

Taken at the beginning of an attack, a single dose of morphine ($\frac{1}{8}$–$\frac{1}{4}$ gr. hypodermically) will generally promptly abort it, and if paroxysms occur only at long intervals this is a proper remedy, but if the attacks are frequent and it were to be given each time, the

danger of forming the morphine-habit would be a serious objection to its use. Some patients find the after-effects of the morphine so disagreeable that they prefer to have less relief by the inhalation of the nitre and chloroform, which are unobjectionable on this account.

Intense mental emotion of any sort has long been known to cut short a paroxysm of asthma; and latterly psycho-therapeutics, in some form and degree of hypnotism, has been used with some success. This will hardly become a practical remedy; it can never come into general use, for probably neither the average patient will have it nor the average doctor be able to use it.

In the intervals of the paroxysms means should be sought to prevent recurrences; to this end the cause of them must be found and removed, if possible, and in a majority of cases this is possible. The personal susceptibility cannot be removed, but it can often by judicious measures be reduced in degree, so that the conditions of a wholesome environment will be incapable of producing an attack.

If the patient has had repeated attacks he has probably discovered what produces them, as some form of dust or odor, or some article of diet, or some physiological derangement. In such instances the proper treatment is obvious. Where the cause is not evident a systematic search is to be made for it. Every organ of the body must be studied in turn to ascertain if it is diseased, or if at the time of the attacks or just prior to each it is in a state of temporary irritation from any cause whatever. If any such disease or irritation is found, even if its coincidence with the seizures cannot be established, it should be dealt with as the possible cause. The removal or amelioration of some distant or apparently unimportant condition of this sort often cures the asthma promptly.

The irritation that oftenest causes asthma is within the nasal passages or in the naso-pharynx or pharynx. Whether polypi or inflammation, thickening of the tissues or ulceration, the disease should be corrected by surgical measures if necessary. Not every case of asthma will be cured by surgical treatment of these parts even when they are in a positive state of disease, nor should the patient be promised it; the polypi should, however, be extirpated and the inflammation treated, and the patient be glad of it, and glad if it also cures the asthma. Cases of asthma that are coincident with nasal polypi are generally curable by removal of the tumors, especially if the latter are in the lower part of the nares.

The removal or correction of deflected septa and hypertrophied turbinates is less likely to cure asthma, but the probability is sufficient to warrant the measures necessary to correct them, especially if the asthmatic seizures are frequent and severe. The danger from

the operation upon the nares in careful hands is slight, and the promise of relief considerable.

If no disease can be identified as a cause, a systematic search is to be made for it outside the body, and the atmosphere the patient breathes is the first object of study. Measures should be taken to ensure its relative purity and, as far as possible, freedom from dust and odors. Everything in the patient's room that could possibly contaminate the air should be removed, including carpets, drapery, all superfluous clothes, beds and pillows of feathers, every article of bed-furnishing that can send dust into the air by any movement of the bed. Of all the offensive dust-producing agencies in the homes of the people, the pillows and beds are unquestionably the worst, especially the pillows. There is not one feather pillow in a hundred in use, by even well-to-do people, out of which dust cannot be seen to gush if the pillow is suddenly squeezed or given a sharp blow. The beds are subject to the same indictment, only their dust is inspired less than that of the pillows. This dust is most irritating to many asthmatics, and is a potent cause of the night-attacks.

The pillows and bed had best be of hair freshly washed and clean, and the ticking and slips, the sheets and blankets (never quilts or comforters), must be washed often enough to ensure their freedom from dust and even odor. The floor of the room should be frequently washed and well dried or wiped with a damp cloth to remove dust, and the walls and ceiling may in some instances receive with benefit the last-named treatment, only less often.

Perfect ventilation should be had, which means manifold more fresh air for the room than the sick or well usually have. At least 1000 cubic feet of fresh air per person should be introduced into the room each hour, and there is no harm from a current of air over the patient's body if he is warmly clothed. The dwelling of the patient should be examined and every evidence of decomposition within or about it, every cause of mustiness, be removed and its recurrence prevented.

Then a study should be made of the dietary, to see if possibly any article of food or drink taken is responsible for the attacks, and of the digestive organs as to their condition just prior to the seizures. Correction of diet and cure of disorders of digestion will often prevent attacks, especially if there is a tendency to gastric acidity and a disposition to eat too rapidly and too much, or there is alternating diarrhœa and constipation. These conditions often obtain in gouty and rheumatic patients. If any digestive disorder exists, it is safe to suspect it as a cause until its correction fails to cure the asthma. The dietetic irregularities that cause skin eruptions are apt to provoke paroxysms in asthmatics. Condiments, coffee, farinaceous

mushes, and over- and rapid-eating often cause them. The correction of constipation, whether or not it alternates with diarrhœa, by means of small doses of laxative tonics taken regularly, or, better, by daily enemas of normal salt solution, is a measure of great importance.

If no cause of the asthma can be discovered, and the practitioner is left to infer that probably a personal idiosyncrasy is responsible for it, he has left to him such measures as have been found empirically to be useful, and such as reduce the irritability of the nervous system.

Of the former, iodide of potassium is more valuable than all other remedies combined. In many cases it is a specific; as long as the patient takes even an occasional dose he escapes. After a course of it sometimes an immunity is enjoyed for a long time; on the other hand, sometimes after it has acted well for a time it loses its effect, and frequently it fails from the first. But among the cases where no cause of the attacks can be found it rarely fails to do some good for a time, and no case of this character should be regarded as incurable till this drug has been faithfully tried. It may be given in (adult) doses of 5 to 30 grains three or four times a day, always beginning with the minimum dose and increasing rather rapidly unless benefit results. No harm comes of the largest dose, and it may be taken many months if necessary. I have known patients to take one or two ten-grain doses each day for nearly a score of years with no apparent injury to health in any way. By this means they could escape the asthma; any attempt to do without the medicine was followed in a few days by a paroxysm. If the iodide of potassium disagrees, the iodide of sodium or the syrup of hydriodic acid should be tried.

General alkaline treatment, by means of the bicarbonate of sodium or carbonate of potassium in the usual solutions or in alkaline mineral waters, helps some cases. Whether it is by correcting some digestive disorder or by counteracting a gouty or rheumatic diathesis it would be difficult to say, but the clinical fact gives support to the claim that asthma is in some instances a rheumatic symptom.

Something can be done to reinforce the nervous system and lessen its mobility in the direction of such reflex action as causes asthma. The measures to be resorted to are good hygiene, regulation of the general regimen, various tonic and alterative medicines, and such drugs as lessen nervous irritability, but never depressing agents to the nervous system, nor over-stimulation or over-feeding.

It is by reinforcing the system that nux vomica, quinine, arsenical preparations, and other tonics have been found useful. They are useful in a proportion of cases, not uniformly so, and it is unlikely that any of them exercises a specific influence over the

disease. Tonics should be used in small doses; large ones are liable to disturb the stomach and so increase the asthma. This is especially true of arsenic, which should be given in the form of arsenate of sodium instead of arsenous acid or arsenite of potassium. The adult dose may be from $\frac{1}{30}$ to $\frac{1}{10}$ grain three or four times a day.

A few drugs probably tend to lessen the reflex irritability of the nervous system and reduce the tendency to paroxysms of asthma. In the so-called idiopathic cases, where the attacks are frequent and there is reason to suspect that the chief cause is the hyperesthesia of the nerve-centres, atropine or some other form of belladonna may be used for a long time, and to the extent of keeping the patient on the verge of constitutional symptoms. The drug produces little or no depressing effect, and often wards off the asthma. One dose a day is enough, the quantity to be as required. But used in this way it is far inferior to iodide of potassium for the same class of cases. Stramonium preparations and hyoscyamus, valerian and the valerianates, and perhaps quebracho and grindelia are useful for the same purpose as the atropine. The bromides are useful, but if given for long the doses should be small, the sodium salt being the most eligible.

If in spite of treatment the asthma persists, some change in occupation, habits, or residence of the patient should be sought, or all together in succession if necessary. Change of occupation may so alter the environment and conditions of life as to eventually remove some undiscovered cause of the disease and lead to recovery; and it is regrettable that it cannot be oftener resorted to. Change of climate frequently stops asthma completely—just how, it is not easy to say. Victims in a low, moist climate should go to a higher region with drier air. For residents east of the Missouri River no region in the world is superior to Colorado and the country south and southwest of it, clear to the Pacific Ocean. Yet, there, some patients fail of benefit, and some helped for a while re-acquire the disorder. Moreover, cases do originate in that region, but the vast majority of patients migrating thither are benefited to some extent. Only a few, however, recover so completely as to be able to return permanently to their former homes without a recurrence, thus showing that there must have been some cause in the climate they left, either some dust or moisture or other contamination of the air, which they escaped in the new home.

Patients unable to remove to a distant State should make, if necessary, repeated experiments of slight changes in climate and residence. Often a little change will produce a marked effect—a move of a few blocks in a city or a few miles in the country, changing the altitude even a hundred feet; any change is justifiable, and the least promising may work a magical benefit.

BRONCHITIS.

Bronchitis naturally includes tracheitis, and thus is an inflammation of the mucous membrane from the larynx to the air-vesicles. It is a very common form of disease, comes in every degree of severity, from a common cold "on the lung" to a mortal malady, and in duration from a short-lived attack of a few days to the lapse of several decades. It occurs most to the young and aged, but no age is exempt; and most in the colder climates and seasons—not so much in the lowest temperatures, when the moisture is mostly condensed out of the atmosphere, but in the moderately low ones. It occurs independently of any other affection, and is a complication of many other diseases, especially tuberculosis and the zymotic fevers; probably it occurs more often in measles than any other disease; it is practically a constant symptom of this affection, and some cases of tuberculosis are only bronchitis. It occurs to some degree also by extension from inflammation in the neighborhood of the bronchi, as from pleuritis and pneumonia. Bronchial catarrh, erroneously called bronchitis, often results from those diseases of the heart, liver, and other organs which interfere with the circulation in the lungs.

Bronchitis attacks people who are housed more than those who live much out of doors, and those reduced in vigor are more likely to have it. It is usually a bilateral disease—always is if due to general or systemic causes; but it may be unilateral from some circumscribed infection (as tuberculosis), some locally acting cause (as a foreign body inspired), or some congenital defect making a part unable to withstand the normal vicissitudes of respiration. It may be mainly confined to the trachea and larger bronchi, or to the smaller bronchi, or to the smallest of all, the so-called "capillary bronchitis." In each variety the inflammation shades off to the normal surfaces without any sharp lines, and it may begin in one of the parts named and extend to another or to all.

The inflammation involves the mucous membrane and the submucous tissue of the air-tubes, and in the severer chronic forms reaches the peribronchial tissues even, often producing marked and permanent changes in them, such as thickening and contraction, sometimes with dilatation of the medium-sized bronchi in places (bronchiectasis). Of course the contraction of peribronchial tissue to produce dilatation of tubes must be irregular; a circular one would cause narrowing of a tube. The lumen of the smaller tubes is, from inflammatory thickening, often decreased, causing obstruction in breathing, especially in expiration, which may lead to emphysema.

There is nearly always some effusion or deposit upon the mucous surface, which is more or less expectorated, the substance varying

from a thin sero-mucus through all grades and conditions of mucoid substance to muco-pus, false membrane, and blood. Transparent mucus and fibrin become opalescent by long retention, and as the acute disease progresses toward recovery the phlegm grows thick and tenacious, as well as opaque. The mucous surface may be excoriated in places, when there is generally some pus produced. These broken surfaces may cause but trifling constitutional symptoms, and be the seat of tuberculous infection and the beginning of phthisis.

The forms and appearances of bronchitis are so variable and manifold, and so shade off into each other, that it is idle to try to make any accurate classification or one that will do more than form a working basis for study and treatment. Subdivision of the cases into acute, subacute, chronic, purulent, bronchorrhœal, and fibroid forms is useful, and not confusing if we understand that these terms are relative and descriptive, and only strictly applicable to a few typical cases.

It is not surprising that bronchitis is frequent when we consider the vicissitudes of atmospheric contamination and changes to which the bronchi are constantly exposed. The dust of every sort, animal, vegetable, and mineral, various irritating gases, and the products of animal life which we all inhale, especially in the wretchedly ventilated rooms, houses, and places of assembly where we congregate, produce most of the cases; the wonder is that they do not produce more. Such influences might be expected to tax severely so delicate a tissue as the bronchial mucous membrane to keep itself in a physiological state and rid its surface of irritants. The delicate cilia of the bronchial cells can only move the most minute particles, and easily become destroyed or disabled: then any foreign substance must be removed, if at all, by coughing, with or without the aid of mucus to entangle it, or by means of the lymphatics; and, as we all know, these agencies sometimes fail.

Lowered vitality makes it easy for irritants and micro-organisms to produce inflammation here as well as elsewhere, and they doubtless cause many cases of bronchitis, both local and general. But localized bronchitis is due to other causes, as some congenital defect in a part or some peculiar arrangement of the bronchial branchings whereby some spot is embarrassed in its circulation and nutrition. An acute bronchitis recovers in the main, but at these spots the vitality is insufficient for this end, and a chronic inflammation continues, or possibly the contiguity of some enlarged bronchial gland may lower the vitality of a spot by making the lymphatics unable to take away the irritating substances from these parts.

We usually assume that tuberculosis, which produces many cases of circumscribed bronchitis, does not start in the bronchial surfaces

without previous ulceration; but it probably often does, and there is much reason to think that sometimes the bacilli are brought to the part through the blood-current and not in the air, and find a culture-medium in the bronchial surfaces and lungs by reason of lower vitality in the particular part. Tubercular bronchitis nearly always sooner or later extends to lung tissue.

Bronchitis is sometimes caused by inspiring foreign substances of tangible size—as vomited matter, or particles of food by a sudden inspiratory act in the midst of laughter.

The most common cause of bronchitis is cold-catching, a process the nature of which we are to a large extent ignorant of. To explain attacks of bronchitis on this theory is in the main to express our ignorance of its true etiology.

Poisons in the form of retained effete matter, ptomaïnes due to failure of action of excretory organs, must predispose to the disease, and there is in some a personal susceptibility in this direction that may itself be the result of some diathesis, gouty or rheumatic, or other cause that may be undemonstrable save by the effect of treatment. Moreover, retained excreta and ptomaïnes positively predispose to colds.

The rate of mortality of bronchitis is not known, as the cases cannot be counted—a majority of them are never seen by a physician—but the rate is certainly low. Most of the deaths are in young children, and from the form known as capillary bronchitis; but deaths are often wrongly attributed to it, since it is demonstrable that many are really due to lobular pneumonia, which often accompanies capillary bronchitis. Many times the bronchial inflammation is secondary to the pneumonia, yet the cases are called capillary bronchitis.

Chronic bronchitis by inducing emphysema finally wears out many patients; in a few it leads to tuberculosis, which destroys life; but it may last many years without greatly impairing the general health. The mortality from acute membranous bronchitis is high, perhaps 20 per cent., possibly higher.

Cough and expectoration are the most constant symptoms of bronchitis, and they present all degrees of severity and many variations in character. If there is much effusion upon the mucous membrane, there is always cough. This act, a single cough-phenomenon, consists in, first, a simultaneous firm closure of the glottis and increase of intra-thoracic air-pressure by contraction of the chest and of the abdominal wall muscles, and then a sudden, free opening of the glottis with a violent outrush of air, producing an explosive sound. The conservative purpose of cough is solely to expel offensive matter from the air-passages by this sudden outrush of air, but it is evident that its expulsive force is most effective in the smaller tubes, where a rela-

tively large blast of air can be brought to bear against a little clump of foreign material. Masses of considerable size may rest on the walls of the larger tubes and trachea, and no ordinary coughing effort be sufficient to dislodge them, and a thin layer of effusion or other substance may cling to any of the surfaces and defy the cough to move it.

Cough is provoked by irritation of the nerves of the bronchi, and the causes of the irritation are several. One cause is foreign matter in the tubes, masses of mucus, pus, serum, or blood, or a mixture of them, with or without contamination by inspired air. Another cause is probably decomposition of these products, which provoke an irritation independent of their mere presence; another, and in many cases a nearly constant irritant, is the inflammation itself, which often makes a patient cough excessively without expectoration.

Cough is an erratic symptom: sometimes with severe inflammation there is little of it unless there is free secretion, while at others it is incessant with the most trifling degree of inflammation, leading to the suspicion that some diathetic state or a hyperæsthesia of the bronchial nerves or a reflex cause of some kind is responsible for it; and, again, cough results from the contact of the atmosphere upon markedly hyperæsthetic bronchial surfaces with little or no true inflammation—a state analogous to cutaneous prurigo. Cough is the result of a blind impulse of nature. The nerves cannot know whether the irritant they feel is a mass of mucus or pus that can be removed, or a sore spot on the tracheal surface; the cough will result the same from each; a foreign body may be expectorated and the cough cease, but a cough from an irritated spot goes on and on.

In acute bronchitis there is frequent fever, rarely very high, unless there is some complication. Very high fever should always suggest the possibility of an intercurrent disease, especially some essential fever or tuberculosis. Infection by ptomaïnes or otherwise may elevate the regulation point of temperature and so produce fever; it may also cause bronchitis, which itself may incorrectly appear to be the cause of the fever. It is regrettable that we do not know more definitely all the infection causes of fever, as well as the reasons why some cases of apparently severe bronchitis are not attended with fever, while others are.

As might be expected, the cases attended by fever have other constitutional symptoms—more depression, discomfort, anorexia, and digestive derangements, with high-colored scanty urine, than afebrile cases do.

The more chronic forms rarely have fever, probably never unless there is some part of the diseased region where pus or products of decomposition are retained and absorbed. If fever continues tuber-

culosis may be suspected, but in bronchiectasis there may be from some small area slow absorption of non-tuberculous morbid products that cause erratic fever of a low grade. Then there may be a rise of temperature each afternoon, half a degree to two degrees, and yet, if the patients can take good care of themselves, they may endure for years this almost daily fever, and suffer only a moderate reduction of their vital powers or of the body-weight.

There is rarely any true pain in the bronchi or in the chest in bronchitis. Often there is a sense of rawness along the trachea and perhaps in the larger bronchi, not infrequently located by the patient at the mid-sternum or below it, but rarely constant for more than a few hours, and then in the more acute cases; in the chronic ones there is commonly no pain or discomfort, but a trifling sense of constriction across the chest may be present. Most often of all may be a sense of tickling, itching, or titillation of the trachea or bronchi or in the larynx or pharynx and attributed to the passages below, and causing a disposition to cough.

In the croupous variety of bronchitis, usually an acute, rapidly developing disease, there is more constitutional disturbance, fever and all its accompaniments, perhaps from the general infection of the system by the cause of the false membrane. If the bronchial surface involved is large, there may be embarrassment of respiration and all the symptoms of profound sickness, and great danger of death. Even after numerous casts of the bronchi are coughed up the danger is not over, for the fever and prostration may continue some days. There is a rare, sharply localized, recurring croupous bronchitis that is almost devoid of danger. The constitutional symptoms are mild or absent, and the seizure lasts perhaps a week, usually to the great solicitude of the patient.

Common acute bronchitis runs a course up to a limit of two weeks, but the febrile period is often not half as long. The expectoration of muco-pus may continue from a week to a month thereafter. In the acute stage, especially in a child and when the capillary tubes are involved, there may be extreme dyspnœa with cyanosis, and high fever with drowsiness. Then the prognosis is grave.

The **diagnosis** of bronchitis in all forms and degrees is not always so easy as it seems. It is confused with irritative, non-inflammatory cough, with lobar pneumonia (catarrhal pneumonia has always bronchitis as an accompaniment), with the bronchial congestion of organic heart disease, and with the bronchorrhœa of nephritis.

After the characteristic signs appear lobar pneumonia should be easily distinguished by these: high fever, bronchial breathing, high-pitched, prolonged expiration, perhaps crepitant râles, dulness on percussion, and rusty sputa. Examination of the heart should

easily distinguish organic disease of this organ and whether it is the cause of increased vascular pressure in the lungs; if it is, then the pulmonary second sound is usually accentuated. In apparently pure tubercular bronchitis there is usually some thickening of the trabecular tissue of the lungs, which is shown at least by a slight increase of fremitus, a reduction of the vesicular murmur, and slight prolongation of the expiration; these signs, too, are often unilateral, or worse on one side—always suggestive of tuberculosis.

Many cases of slight non-tuberculous bronchitis must be diagnosed solely by the symptoms; there are no physical signs, save perhaps so slight an increase in the normal bronchial quality of the breathing as almost to escape detection. This is particularly the case with inflammation of the lower trachea and the larger tubes; there are no râles, and the bronchial breathing is so slight as to suggest that it may be normal to the individual. Of course, there is no change in the resonance, except trifling dulness at spots where there is lobular pneumonia; these spots are seldom demonstrable; in the chronic cases a slight degree of emphysema usually increases the resonance.

The laryngoscope reveals some redness in the acute cases, with slight narrowing of the trachea and the bronchi at the bifurcation.

All sorts of râles and rhonchi are heard in bronchitis (except perhaps the crepitant ones), from the moist subcrepitant râles of capillary bronchitis to the coarse, dry rhonchi of the subacute and chronic forms. They are subject to much fluctuation from day to day, even from hour to hour, but in pure non-tubercular bronchitis they are usually bilateral. Râles that are persistently unilateral suggest either tuberculosis, localized pneumonia, or bronchiectasis.

Treatment.

The proper treatment of bronchitis depends on the stage and character of the inflammation. Many patients are treated domestically with nothing but a variety of expectorants and with some irritating or warm applications to the chest. In many such cases recovery is prompt enough and without the patients ceasing their daily duties.

For an acute case of any severity, especially if much fever is present, the most useful measure is recumbency in bed for a few days, two at least, and in a well-ventilated room. At the same time the patient should be so warmly clothed over his whole body as to keep him constantly on the verge of perspiration. Bed-clothes are not enough, for the arms are sure to be out of bed much of the time, and the shoulders need more warmth than any common night-gown supplies. A good addition to the bed-clothing is a sack, a jacket, or a nightingale (a piece of wool-flannel a yard wide and two yards long,

covering the shoulders and arms and pinned at the neck and wrist), which prevents the chilling of the upper portion of the body. The night-gown should be woollen. In this way rest in bed more powerfully aids in the restoration than any other treatment, for it reduces the exercise of the body to a minimum and gives the system, often lowered in vigor, a chance for recuperation; and it guards against temperature-changes, as well as other vicissitudes that might prolong the attack.

By promptly resorting to this treatment, with the addition of an opiate—10 grains of Dover's powder or its equivalent—an attack of acute bronchitis may often be aborted and brought to an end in two days that otherwise might continue for weeks. There is some, but not great, reason to think that quinine given to the point of cinchonism aids in this consummation.

Hot poultices and other fomentations to the chest are popular in certain quarters, and are useful if they can be maintained at a high-enough temperature. But they require to be changed frequently; if allowed to become cold they do positive harm, and in the act of changing them the body is exposed to the air and may be chilled. At best, they are only an article of clothing, and are not half so workable and convenient as a jacket made of thick cotton or wool; they are subject to more dangers in use than the latter, and are not a particle more useful. Nothing has shown more the value in acute bronchitis of warm clothing for the body than the good effect of these chest-dressings, and general clothing of the body as a whole is quite as valuable.

The patient should be cautiously and well fed with the most digestible food—should have the bowels kept free and take tonics, especially the bitter and stimulating ones. One grain of quinine and a sixtieth grain of strychnine every two to four hours, with some aromatic, and some small doses of alcoholic stimulant if the latter be allowable, constitute perhaps as useful a combination as any.

Anodynes in moderation are called for if there is much discomfort or excessive cough, or cough beyond the necessities of freeing the passages of phlegm. Codeine is one of the best; morphine or opium in some form, with ipecacuanha or tartar emetic for a slight expectorant effect, is perhaps next in value. Paregoric is eligible, and may profitably be given with syrup of ipecac and of squills, in equal parts. These anodynes should be used in the smallest doses capable of producing the desired effect, unless one full dose is given in the hope of aborting an attack. They should never be given to "stop the cough" so long as it brings up phlegm, but may be used to quiet an aggravating, useless cough. Opiates should be used with great caution in infants and children. A good combination

for children who object to taking medicine is $\frac{1}{4}$ grain of morphine and 1 grain of tartar emetic in a gobletful of water, a teaspoonful being taken once in one to four hours according to the severity of the cough and distress. A child will rarely object to it, and each dose represents about $\frac{1}{250}$ and $\frac{1}{60}$ grain of the drugs respectively.

Some of the expectorant drugs with anodynes are allowable when the cough is "dry;" they tend to cause a freer flow of mucus and serum, making a phlegm which the cough can easily expel. The most useful expectorants are ipecacuanha, squill, senega, sanguinaria, tartar emetic, and apomorphine, which should always be administered at first in minimum doses, to be increased if necessary, but there is no need of ever carrying them to the point of nausea. In my observation ipecac and tartar emetic stand first for acute, sthenic cases; apomorphine is much prized by some practitioners, but is less useful. Free expectoration has the advantage of carrying off particles of inhaled dust that may irritate the respiratory membranes, and may in some other manner, as it often seems to, still further relieve the irritation. But the indiscriminate use of anodyne expectorants in colds and coughs is mischievous, for they often impair the digestion, reduce the appetite, cause constipation, and stop or lessen a cough that is most salutary in removing offensive materials from the bronchi, and in these ways prolong many cases of bronchitis. The irritation of the bronchi that causes a dry cough may often be assuaged by inhaling steam from a vessel of boiling water. A little turpentine may sometimes be added to the water with benefit. Inhalations of pyridine are useful for this condition.

In the recovery from acute bronchitis warm clothing should be maintained, and a mild tonic treatment continued; overwork should be avoided lest it retard the recovery; good feeding, but not overfeeding, and perfect digestion are important.

In the capillary bronchitis in infants and children the treatment with stimulating tonics, warm applications to the body, especially the chest, and perfect quiescence in bed should be insisted on. The anodynes may be used if necessary, but always with caution as to doses; nothing approaching narcotism is ever safe. The danger of giving too much medicine to these young patients, too large and too many doses, is one that every practitioner should guard against. Generally such patients are overdosed.

The treatment of the more chronic forms of bronchitis requires special consideration. Here we have an inflammation of a lower order of activity than the acute, and one which for some reason tends to continue. The tendency of every inflammation of mucous membranes must be to recovery; yet here is one that often goes on for months and years. There must be some cause that directly keeps

it up; it does not continue from total depravity of the tissues or of the physiological processes.

The first rational step in treatment would be to remove the cause if possible. One of the causes is certainly irritating things inhaled, as dust of various kinds, and irritating gases, such as sometimes provoke attacks of asthma. It is possible that some persons have bronchial mucous membranes preternaturally sensitive to irritation. They acquire chronic bronchitis from the irritating properties of the atmosphere that to the average person produce no effect whatever. For perfect safety such patients require a selected and protected atmosphere to breathe. Better ventilation of rooms occupied by the patient at his work and in his home would do much to remove these injurious influences. This is the first and greatest step in the direction named, and perfect ventilation means the admission of an amazing amount of fresh air into the rooms constantly. If the occupation involves exposure to a great deal of irritating dust or gases, it should be abandoned for something less baneful.

A high degree of humidity of the atmosphere when cold—near the freezing-point—tends in some susceptible persons to produce or prolong the disease. Only a change of climate would completely eliminate this cause, but the patient can usually clothe himself in such a manner as to minify the effect of the damp cold. Chilling of the surface of the body is more harmful than the damp air, especially in a person below his normal standard of vigor.

People in general are too fearful of feeling warm and of perspiring, and patients with chronic bronchitis need to learn to feel warm and insist on it at all times. They should sleep in woollen night-gowns winter and summer, and wear woollen underclothes during the day, and of as heavy weight as they can bear. If the wool irritates the skin, a thin silk or cotton or loosely woven linen garment may be worn under it. At night the clothing should be so abundant that thorough room-ventilation may be allowed without harm. There will be no cold-taking if the body is warm, even if a draught of air is felt over the face, but a woollen night-cap may be required to complete the clothing.

Chest-protectors of leather or flannel are of value in some cases, especially where the clothing worn over the anterior chest-surface is thinner than that of the rest of the body; but except in such cases they are not as good as a uniform distribution of clothing. To keep the chest warm and allow the limbs to be cold cannot help a chronic bronchitis.

The evidence is considerable that the disease is sometimes prolonged, if not caused, by retained excreta, by some failure of depuration, or by some diathesis. Of the latter the rheumatic and gouty

are just now coming to be held responsible for many symptoms not formerly suspected to have any connection with them. Neuralgic pains in various parts of the body, migraine, sore muscles, and various inflammations of mucous membranes are now attributed to retained uric acid or the rheumatic diathesis, and, it may be said, with good show of reason. This possibility should always be considered in chronic bronchitis, and if there is even a moderate probability of the existence of the gouty or rheumatic diathesis, the antidotal treatment should be tried; no harm can come to the patient from a few weeks' anti-lithæmic or anti-rheumatic treatment and much good may be done.

Organic heart disease, such as mitral regurgitation or obstructive lesions, causing distention of the bronchial vessels, always produces congestion of the mucous membrane and frequently cough, and if not actual inflammation it may at least prolong the latter. Measures to ease the load and to increase the strength of the heart are valuable; hence reduction of exercise, a careful life, free elimination, and the use of digitalis and strophanthus are in order.

Many cases of chronic bronchitis are greatly helped by medium doses, long continued, of iodide of sodium or potassium—just why it is impossible to say. This form of medication should always be tried in cases not due to removable causes. General tonics should also be used for a long time if the system is below its standard, cod-liver oil and the Peruvian bark bitters being the best, but the latter should not be given in large doses. The arsenate of sodium in small doses ($\frac{1}{60}$ to $\frac{1}{30}$ grain), long continued, will help a proportion of such cases. Many practitioners have faith in a patient use of the various balsams taken internally in doses so moderate in size as not to disturb the stomach. Those especially to be mentioned are balsam of Peru, Canada balsam, and balsam of copaiba. The emulsion is a good form for administration. A protracted use of small doses of some of the expectorants (without opium or its preparations) helps chronic cases sometimes, but if they interfere with the digestion and nutrition they should be abandoned at once. Inhalations of vapors of balsams, alteratives, and antiseptics, commended in this paper for bronchiectasis, are of some value in this class of cases, but to do much good they must be long continued, and patients often get tired of them or complain that they irritate and annoy rather than help. Where there is little expectoration and much cough the inhalation of pyridine may be used with benefit; it may soothe the irritation and produce a muco-serous exudation that is to a degree protective to the mucous surfaces and helps to carry off old and irritating accumulations.

Injection of drugs directly through the glottis into the trachea deserves to be used more. It may quiet an annoying cough that is useless, as well as aid in the recovery from the disease. A good mixture

for this purpose is cod-liver oil holding in solution 1 or 2 per cent. of eucalyptol or guaiacol, or both. A quarter to half a drachm may be used as a dose, and repeated every day or two if it gives relief. A long, curved nozzle is necessary, and may be attached to a syringe or a compressed-air spray apparatus.

For bronchorrhœa turpentine and terpine hydrate have been highly commended. They may be taken in small doses for a long time if they do not disturb the stomach. The balsams already referred to have some reputation for the same purpose, but of course no such specific medication is at all comparable to those measures that increase the vigor of the body and enhance its resisting power.

In bronchiectasis the aim should be to keep the bronchial cavities empty; especially is this important if the expectoration is fœtid, for it is reasonable to suppose that decomposition of the contents of a cavity will increase the irritation of its walls and prolong and aggravate the peribronchitis, if it does not keep the temperature elevated. Inhalations of various gaseous antiseptics have been used, but with small benefit. Iodide of ethyl 1 part, eucalyptol 1 part, alcohol or compound spirits of ether 6 or 8 parts, make a good inhalant, which may be respired from a sponge in a large-mouthed bottle or from a sponge in a tube, a few inspirations at a time, several times a day. The monochlor phenol, inhaled through a glass tube containing a small pledget of cotton saturated with the drug, does some good; its vapor is heavier than air, and hence would tend to remain in the lungs and prevent or retard decomposition. This drug is disagreeably malodorous. Sprays of diluted peroxide of hydrogen have been used, but it is doubtful that they reach the bronchiectatic cavities; they would prevent fetor if they did.

If the cavities can be evacuated frequently, the fœtor is nearly sure to stop; the contents are retained because of gravity; hence inverting the body for a few minutes at a time, or changing its position so as to favor the outflow into large bronchi and the trachea, will often enable the patient to evacuate the accumulation, and he can perform the manœuvre at will.

The most useful treatment of very chronic bronchitis is change of climate, and life in the open air. Dry atmospheres are useful, as are high altitudes also in many cases. The greatest advantage comes from living in such places as favor out-door life at all seasons of the year. The best climates of America for this purpose are those of Colorado, Southern California, New Mexico, and Arizona. These present every gradation of humidity from moderate (Southern California south and west of the mountains) to extreme dryness (Arizona and Southern California desert), and all altitudes from sea-level or below it in the Colorado Desert in Southern California to seven

thousand feet or more elevation in Arizona, Colorado, and New Mexico.

For many chronic patients who live in cities and breathe, as all such must, a contaminated and impure air both in and out of doors, it is quite impossible to effect a cure at home. A few months' residence in the climates and conditions named will generally produce a marked improvement if not a complete cure; several years of residence is much more useful.

The good effect of the climate is increased by frequent cool or cold baths, with brisk rubbing or massage to produce a glow of reaction. Many physicians claim that cold bathing will "toughen" people, especially children, and prevent recurrences of bronchitis. Living in the best climate is no excuse for sleeping in a poorly ventilated room; the bronchitis patient must always and everywhere breathe the best air.

WHOOPING COUGH.

Whooping cough is a contagious, doubtless microbic, disease affecting chiefly the more vigorous infants and children. It is self-limited, and is probably transmitted through the breath or sputum, or both, and renders its victim immune for a certain period from further attacks of the disease. It is characterized sometimes at first and temporarily by slight elevation of temperature, which soon subsides, and for a few days by all the symptoms of a moderately severe catarrh of the respiratory mucous membrane, sometimes of the eyes also, and especially by a common cough, which later becomes distinctly paroxysmal in character and lasts in this form usually from two to eight weeks. The fits of coughing occur at varying intervals of a few minutes to as many hours, and last from a few seconds to a minute or more, and are intense in the rapidity and force of the successive coughing efforts, and in the excess of the expiratory over the inspiratory efforts; the lungs are emptied of all that is possible of their residual air by several expiratory efforts in quick succession, after which, and when the fit appears to be mostly spent, there is a deep, long inspiratory effort, often against slight spasmodic closure of the glottis, and so producing a whooping sound. The patient often feels premonitory sensations of an approaching attack, and may clutch at something for support; during the fit his conjunctivæ are suffused, his face may be swollen and purple, eyes slightly protruding, and the skin be moist with perspiration, while his whole aspect gives evidence of a profound muscular effort; and

at the end of the paroxysm, if not in the midst of it, he may vomit.

The disease through all the later days of its course usually appears to be strictly a spasmodic nervous affection ; there is no fever, and if vomiting is not so constant as to deprive the system of sufficient nourishment, not much weight is lost or debility induced ; between the paroxysms there is usually no cough or other evidence of bronchitis ; and the patient goes about much like a well person, except for the fits of coughing, which are frequently provoked or precipitated by exercise, excitement, draughts of air, or by eating, and are nearly always worse at night, when these exciting causes cannot be operative.

There are no known lesions of the disease save the initial catarrh of the respiratory mucous membrane, and later slight irritation of the larynx, epiglottis and trachea. The larynx is extremely sensitive to irritants of any kind. The micro-organism producing the disease has not yet been demonstrated with certainty, although considerable evidence has been accumulated. Leucocytosis to a marked degree has been found to characterize this disease.

Deaths often occur from the disease, mostly in infants and very young children, and then almost wholly from complications. Lowered vitality is frequent, due to the varying effects of severe and frequent paroxysms and the loss of meals by vomiting ; and intercurrent diseases occur easily under such circumstances. One of the more common is bronchitis with catarrhal pneumonia, produced sometimes by the inspiration of particles of stomach-contents at the time of vomiting. But the automatic closing of the glottis which occurs at the end of many paroxysms is, although momentary, enough to prevent to a large degree the inspiration of food and mucus, and so is conservative. Another complication that destroys a proportion of infant patients is convulsions—an accident not to be surprised at when we consider the severe strain to which the circulatory apparatus of the cerebrum is subjected in the paroxysms of cough.

As a further result of the strain which the blood-vessels have to bear, occasional hæmorrhages occur, sometimes severe, from various mucous and serous membranes, as the nose, mouth, throat and stomach, bowels, and even the pia mater. Temporary blindness may occur.

The prognosis is bad in proportion as the fits of coughing are frequent and severe ; frequent paroxysms with emesis and resulting poor nutrition, especially in delicate subjects (either from debility or youth), speak for the gravity of the prognosis ; infrequent paroxysms that do not or only rarely evacuate the stomach, in vigorous patients able to maintain their nutrition, speak for trifling danger.

The diagnosis is rarely difficult after the cough has become paroxysmal and the early catarrhal symptoms have subsided. Before this

period cases resemble an ordinary cold or the influenza, and the diagnosis can often not be cleared up till the second stage of pertussis develops.

The cough of a paroxysmal character is the only symptom that is invariably present and noticeable. The whooping sound is occasionally absent, and may be present in other diseases, and the catarrhal symptoms at first may be so slight as to be denied by the patient. The spells of cough with tranquil intervals are never absent. Few other disturbances produce such paroxysms. There is a paroxysmal nervous cough produced by other irritants than the microbe of whooping cough; it occurs more in adults than in children. Sometimes it appears to be due to ptomaïnes absorbed from the intestines, or to uremia, or a rheumatic diathesis; sometimes to a moderate laryngeal irritation in a very nervous person; sometimes to foreign bodies inspired into the bronchi, as particles of food, which may produce occasional fits of coughing for many weeks. In all these conditions, however, the cough lacks the sharp, quick, spiteful character of that of pertussiss, with the long, deep inspiration at the end of the fit and the calm that follows.

Whooping-cough patients should be isolated from other children as soon as a diagnosis is made; children who have never had the disease should be kept away from them. The act of some parents, on the assumption that their children must some time have the disease, and might as well have it one time as another, of knowingly permitting their exposure to it, is little less than a crime. Susceptibility decreases with the age, and if a child can be spared till his tenth year he is likely to escape through life, or if he does acquire the disease its dangers will be greatly reduced. All clothing used by or about the child, all utensils and fomites, should be disinfected by thorough boiling or by dry heat.

It is almost certain that a patient is capable of infecting others for at least a week or ten days after the paroxysms cease, and it is unfortunately probable that the infection is given before the paroxysmal character of the cough makes the diagnosis certain.

The period of incubation is probably seven to ten days.

Treatment.

There is no specific treatment for whooping cough. Nevertheless, there are many useful things to be done which may increase the prospects of recovery. Of course, the prime object of treatment is to lessen the frequency and severity of the kinks and to assuage the irritability of the upper air-passages, until the disease ends spontaneously.

As the disease is limited in duration, it is manifest that if the strength of the patient can be maintained and accidents avoided he will recover. To this end his nutrition must be kept up; if he vomits his food he should take a little easily digested or predigested food every

hour or after each act of emesis. Some of the infant or invalid foods do very well, or, better, the expressed juice of slightly cooked fresh beef; a lemon-squeezer or a press of iron may be used to express the juice. Curdled eggs, or raw eggs beaten up with milk or water, constitute one of the best of all foods for such patients. Four to eight eggs a day are not too much for a child of four years, in addition to two to six ounces of meat-juice, with perhaps other foods. If only a small part of this is absorbed, it will quite effectually prevent any loss of weight or any great loss of strength, but it will never do in a severe case to rely on the usual three meals a day; there would better be a dozen meal-times a day than three.

Tonics and stimulants are useful to the same end, and, if possible, should always be employed where depreciation of the vital powers is apparent. Strychnine and quinine are the best of all tonic medicines, but owing to their bitterness it is often difficult or impossible to give them to young children. The taste can be covered to some degree by the syrup of coffee, liquorice, or chocolate, and occasionally a child can swallow a pill or capsule. It is not necessary to give large doses; the equivalent of an adult dose of $\frac{1}{40}$ grain of the former and 1 grain of the latter, according to the age of the child, and three or four doses a day, is enough. The tincture of the chloride of iron is useful, and may be given to almost any child in lemonade or milk. If vomiting occurs soon after a dose is taken, another should be given immediately. Alcoholic tonics are eligible or demanded in all cases of debility: they should not ordinarily be given in the milder cases. Children usually stoutly object to the odor of whiskey and brandy. When given these liquids should be diluted with six or eight times as much slightly sweetened water; this often removes the objection to their taste and smell. Deodorized alcohol (Cologne spirits) has very little odor, and may be given surreptitiously in water, milk, or lemonade to almost any child. It is an advantage, too, that only half the dose is necessary as compared with whiskey and brandy. It is difficult to say just what the daily dosage should be in a case; only enough should be given for a tonic effect; no stimulation above the physiological standard should be allowed, nor should any drug or stimulant be taken that disturbs the stomach or causes vomiting.

Something can be done by various treatments to lessen the frequency and severity of the fits of coughing and to ward off complications, and almost countless drugs and measures have been invoked to this end. But if the strength and weight of the patient can be maintained by the measures recommended above or otherwise, more is accomplished to lessen the discomfort from this disease and its mortality than if all other good influences combined are used to the neglect of these considerations.

The first step in this direction is to protect the child, if possible, from all influences that aggravate the disorder and precipitate attacks; hence, excitement must be avoided, and over-exercise, cold winds, and too much or too little clothing. The child should, in short, be guarded by as perfect hygienic conditions as possible, to the end that complications may be prevented and the body-vigor be kept at as high a standard as possible. Too much exercise and excitement are sure to lower the vital powers and increase the coughing fits. But out-door life to a considerable extent is desirable, even remedial. Rooms occupied by the patient should be perfectly ventilated, and protection against harm from draughts can be had by warm clothing. Fear of draughts nearly always leads to poor ventilation, and an abundance of clothes is a good remedy. The night-clothes should be long and closed at the bottom to prevent the child from kicking himself naked.

The tonics already recommended lessen the tendency to the occurrence of paroxysms by reinforcing the nervous system, and quinine has some reputation for markedly reducing the cough, when taken in liberal—that is, cinchonizing—doses. Used in this way, it is one of the most useful of all drugs. It cannot be continued in such doses throughout the sickness if this lasts several weeks, but it may be given to the verge of cinchonism, and kept just short of it as long as the disease lasts, provided it seems to do good and does not disturb the stomach or make the head ache, for it may cause the latter without the tinnitus of cinchonism.

As the chief symptoms of pertussis are nervous in character, it is natural that the profession should have sought to cure or abbreviate the disease by measures addressed to the nervous system. To lessen the nervous irritability seems a prime desideratum, and almost every drug having any reputation for this purpose has been used at one time or another. Some dozens of them have been lauded as efficacious by their respective advocates, to be condemned as useless by others more skeptical who have tried them. It were a waste of space to recount all this testimony, for it is evident that much of it that is favorable has been given on insufficient observation, and probably some of the adverse evidence is no better. One thing is clear—namely, that no anodyne drug should be used, except under the stress of some emergency, if it disturbs the digestion or interferes with the nutritive functions or the powers of life. Hence, opium and all its preparations and derivatives are objectionable, although they do sometimes temporarily reduce the paroxysms, and perhaps vomiting also. They should be used only when a strictly temporary effect is required, and then in minimum doses, and the safest preparation of the list is codeine or some of its salts.

The coal-tar products, antipyrin, acetanilid, phenacetin, and others,

have been employed with temporary benefit, but their use throughout the course of the disease, in doses sufficient to temper the symptoms, is likely to lower the vitality enough to counteract their good effects. Of them all, antipyrin seems to be the best, and may be given in the dose of 5-10 grains (for an adult), repeated several times a day in cases demanding it.

Little treatment is required during the catarrhal period. If the cough and catarrh are excessive, a weak mixture of morphine and tartar emetic may be used very cautiously, as recommended in the section on Bronchitis. Any child will take it readily, and disagreeable mixtures are not called for. The trifling fever never requires treatment, and the use of so-called "fever mixtures" containing aconite are somewhat worse than useless. The bowels should not be allowed to be constipated, and laxatives may be needed, the best for children being calomel or castor oil.

If the patient is restless and wakeful, a little bromide of sodium or antipyrin, sulfonal, or trional may be given.

For the paroxysms, musk, valerian, asafœtida, and this class of stimulating anodynes are rational, but cannot do a great deal of good, and are offensive to children.

The most rational class of drugs consists of the compounds of bromine, the bromides, hydrobromic acid, and bromoform, and they may be given continuously for many days. The effect of these is to lessen the irritability of the nerve-centres, and so if possible to decrease the paroxysms. While good effects might be expected from this entire class, only the bromoform has acquired any marked reputation in this disease; and as to this there is conflicting testimony. Some insist that it is a sort of specific, and always cuts short the disease or lessens the severity and frequency of the attacks; others as stoutly declare that it produces no perceptible effect whatever. Probably the truth lies between them: the drug is not a specific, but it does mitigate the severity of the disease, and by virtue of its bromine; any other form of bromine used as faithfully might do as well.

Bromoform is an oily liquid, and may be given from 1 to 8 drops at a dose, depending upon the age of the child, in a drachm or two of water (with which it does not mix) or a simple emulsion. Three to six doses may be given a day, according to the severity of the disease. Children take the drug well enough, but it is decomposed by the daylight and therefore most be kept in the dark.

If in spite of the treatment the sleep is greatly disturbed by the cough, hydrate of chloral is eligible; it both quiets the cough and induces sleep; but the smallest dose capable of accomplishing the purpose should be used. If convulsions occur or are threatened, this is the most useful drug of all.

Belladonna was once in high favor for quieting the irritability of the nervous system, and it deserves to be more often employed. It has the advantage of being safe in doses sufficient to produce its constitutional effects, and should be continued throughout the sickness. Atropine is the most reliable preparation, and should be given in the (adult) dose of $\frac{1}{200}$ grain, repeated often enough and in increasing doses, if necessary, to produce very slight dryness of the throat and possibly a little flushing of the face.

In cases of great prostration and evident overstrain of the heart with dilatation digitalis is useful.

Chloroform may be wisely given by inhalation in extreme cases where it seems imperatively necessary to cut short the individual paroxysms. But only an experienced and careful nurse should be entrusted with its administration. A few drops on a cloth held to the nose the instant a paroxysm is imminent will stop or lessen it, provided one or two full inspirations can be taken before the attack is fully under way.

Local treatments to the throat, larynx, trachea, and nasal passages have been much used, and have consisted of powders insufflated, solutions applied to the throat or sprayed into the passages, and various vapors inhaled.

Of powders, quinine, bismuth salicylate, benzoin, and boric acid have been used, all greatly diluted with some inert substance, as acacia or sugar of milk. They have done some good, but are hardly to be recommended for children, who generally are frightened by them. Probably the best among them is quinine in the proportion of 5 to 10 parts of the hydrochlorate to 10 parts of bicarbonate of sodium and 100 parts of gum arabic, of which a few grains may be used two or three times a day for insufflation into the throat. Good results from the use of these insufflations into the nose are reported.

Among the sprays of value are carbolic-acid solutions ($\frac{1}{5}$ to 1 per cent.), tannin, and bichloride of mercury (1 : 2000 parts). The carbolic acid spray is useful and safe, provided the patient will submit to it without a struggle. Cocaine solution (2 to 5 per cent.) may be applied to the throat with a brush, but it should be used with great caution and only in an emergency.

Of the inhalations, probably very weak sulphurous acid gas, produced by burning a minute quantity of sulphur in the room, the vapor of the oil of eucalyptus, and the vapor of impure carbolic acid, thrown into the air by the heat of a lamp, are the best of all. The last fulfils the same purpose as the spray of carbolic acid, and is less disagreeable to the patient. The air of the room may be slightly charged with it constantly.

ACUTE AND CHRONIC ORGANIC DISEASES OF THE HEART.

By W. H. THOMSON, M. D., LL.D.

With organic diseases of the heart, account must be taken not only of lesions or changes in its own proper mechanism, but the conditions obtaining throughout the whole apparatus of the circulation should also be concurrently noted. For while it is true that disorders of the heart affect the circulation, the converse is equally important that disorders of the circulation will affect the heart. Thus we have long ceased to regard the presence of a cardiac murmur as the chief symptom to establish either the form or the degree of heart disease; still less can it be mainly relied upon for prognosis or as a guide for treatment. Physical examination of the arteries may afford as important indications of the nature of cardiac disease as physical examination of the heart itself; and the same may be said of signs observable in the venous, lymphatic, and capillary systems. The circulation, in fact, is more extensive still in its course, for the rapid effects of a hypodermic injection show that the interstitial fluid outside the capillaries moves at a scarcely slower pace than the intravascular current, and many cases of labored heart-action, leading in time to serious organic changes in the heart, doubtless arise first in a disordered state of the interchange between the intra- and the extra-capillary fluids.

These facts receive a good illustration in the marked difference which exists between acute and chronic diseases of the heart. Acute diseases of the heart, like acute diseases in general, are of the nature of accidents, because their cause is usually external, such as infection or exposure. Like accidents, also, they are local in their seat, and commonly show a tendency to recover, with or without certain special complications or sequelæ. Chronic affections of the heart, on the other hand, like most chronic affections, are not accidents, but are often associated with wider and more general conditions, such as diffused vascular disease or affections of the lungs or kidneys. The treatment of these two classes of heart disease, therefore, may differ as much as the treatment, for example, of acute pneumonia and of chronic pulmonary phthisis.

We can begin, therefore, with the separate consideration of acute diseases of the heart, and we will take them in the order of their frequency in practice, rather than after any anatomical system.

ACUTE DISEASES OF THE HEART.

Acute Endocarditis.

This affection is most commonly caused by the presence of a poison in the blood, of which the chief is that which occasions either acute articular rheumatism or chorea. In its ordinary form, chorea is due primarily to an irritation of the cerebral cortex by the presence of the rheumatic toxin, however it may have been localized there in the first instance by some nervous excitation like fright, etc. Its rheumatic nature is shown by endocarditis being scarcely a less frequent sequel to chorea than it is to rheumatic arthritis. It is important to note that this endocarditis may develop, as Osler has shown, months after the choreic symptoms themselves have subsided, so that the heart should be frequently examined in such cases after their seeming recovery. Acute endocarditis sometimes follows suppurative tonsillitis, as might be expected from the common supervention upon this inflammation of acute rheumatism itself. This fact also lends support to the theory that some form of bacterial invasion is the ordinary cause of acute endocarditis, and its occurrence in scarlatina, with or without rheumatic symptoms, and occasionally in measles and in diphtheria, can be ascribed very probably to the mixed streptococcal infection which often has been demonstrated in these affections. Endocarditis also occurs in a severe form from corresponding septic absorption in pyæmia, or in a milder form from less pronounced sepsis in diseases characterized by ulcerative processes, such as typhoid fever, smallpox, and phthisis; and even when it develops in both acute and chronic nephritis its infective nature may still be inferred from the lessened resistance to such invasion caused by the presence of renal disease.

As in other acute inflammations, the tendency to local development is illustrated in acute endocarditis by its almost exclusive limitation to the left side of the heart. It would appear as if the inflammatory poison needed arterial blood for its efficacy, for in the fœtus the right side of the heart, which receives the arterialized blood first through its auricle, is oftener attacked than the left. To this may be added direct impact, because at the aortic orifice it is the ventricular surface of the valves which is attacked, while at the mitral it is the auricular. The inflammation begins with a reddening of the valves, especially at their

lines of junction, where rows of small granulations soon form which are quite analogous to those of an inflamed conjunctiva, and, like these, they soon become sources of further irritation of the smooth, rapidly-moving lining on which they develop; with this difference, that in the heart the disintegration of the leucocytes which infiltrate the granulations leads to the direct deposit of fibrin upon them from the passing blood. By this means they grow into vegetations of more or less size, sufficient to extend the irritation by friction to the whole valvular surface, and then to the walls of the heart itself. In the case of long vegetations, reaching down into the heart, local ulcerative action may be recognized where the tips of the processes have come thus into contact with the contracting ventricular wall, which may lead even to a circumscribed abscess in the muscular substance. At other times this action is more directed against the root of a valve, causing an ulceration which may perforate it or sever its connection with one of the chordæ tendinæ, or so lead to distortion of the valve in cicatrization as permanently to damage its working.

In many cases acute endocarditis, owing to its limited area, begins with such moderate constitutional symptoms that but for auscultation its presence would not be suspected. Thus in autopsies of typhoid fever and of phthisical subjects it is found to have existed in some without having been detected in life. This fact, therefore, always should lead to frequent examinations of the heart in those acute diseases in which its occurrence is likely. Before auscultation reveals its beginning, however, I have often found, without there being any pericarditis, tenderness on pressure made in the epigastrium upward under the left arch of the costal cartilages at the end of expiration. The patients catch their breath, while the heart gives a few rapid beats from the pain produced. It is important to note that in children with rheumatism endocarditis often develops while both the joint symptoms and the fever are very moderate. Thus a boy, aged twelve years, two days after sitting on the cold ground watching a ball game, complained only of some stiffness of one knee and in the opposite ankle. I found his heart unaffected then, but the next day, though only the knee remained slightly inflamed, endocarditis had already begun, and continued to progress, while the joint symptoms steadily declined. No doubt, therefore, many cases of chronic heart disease, whose origin is unknown to the patients or to their friends, may have begun thus in some early slight rheumatic attack, whose pains were supposed to be of the variety termed "growing pains," and hence children who have passed restless nights with such pains should be frequently examined for cardiac symptoms.

As the inflammation progresses, however, an increase of fever and of pain, referred to the præcordium (by children to the stomach), with pal-

pitation, is the rule. The temperature is variable in different patients, ranging from 101° to 104° F., and apparently dependent not so much upon the endocarditis as upon the disease in which it occurs. The expression also often becomes anxious, a sign of particular importance in children, as it differs so much in them from the expression of pain. The signs on auscultation in the ordinary form of this affection are commonly systolic, rarely diastolic, murmurs, oftener at the apex than at the base, and not infrequently of a loud blowing character. The loudness of the murmur is no index of severity, for it is not as serious a symptom as a feeble murmur with disturbance of rhythm and unfavorable general symptoms. The duration of such an attack of endocarditis is very variable, but the prognosis, as far as the existing inflammation is concerned, is good; for the majority of such cases recover, without the patient being aware that a permanent mischief has befallen him. In many instances, however, the pulse remains frequent and the heart irritable for a long time afterward. Its physiological unrest is itself the cause of the delayed subsidence of the inflammation, and hence the difficulty of checking a moderate endocarditis in children, from their being allowed so commonly to get up too soon and to act like other children in their sports.

In more severe cases of acute endocarditis the pain, fever, and rapid or irregular heart-action may be much more pronounced, and the distress of the patient from them be very evident. But in other cases these symptoms may be comparatively slight and the temperature low, while the constitutional symptoms are very grave, resembling the terminal stages of typhoid fever, meningitis, or general tuberculosis. One manifestation, however, should at once suggest endocarditis instead of these diseases, and that is ecchymoses on the skin, with or without hæmaturia. These are due to a stream of fibrinous emboli sent into the circulation from their soft-clotted sources in the heart, the larger ones when arrested in some viscus often occasioning rigors with elevation of the temperature, so as to simulate remittent fever. The course of these cases may be prolonged for many weeks. The prognosis is bad: the pulse is rapid and feeble, the patient being sometimes much distressed with dyspnœa or attacks of syncope or other signs of the formation of heart-clots, while others die after severe cerebral symptoms, such as delirium or stupor, or with signs of intercurrent inflammation from infection of the lungs, liver, spleen, or kidneys. Such cases are hardly distinguishable from malignant endocarditis either clinically or pathologically, except that recovery does occur in some even after they have shown ecchymoses quite extensively.

Treatment.—Naturally, the first indication is to deal with the blood-poison which is causing the inflammation. As regards the

commonest agent of the kind, I have little doubt that heart inflammations have increased in frequency since the introduction of the salicylates in the treatment of rheumatism, compared with the time when the alkaline treatment was more generally followed. That a full, and not a partial, recourse to alkalies will render carditis in any form uncommon in all patients, except children, with acute rheumatism, I believe as implicitly as did Fuller himself. That either form of treatment has much advantage over the other in shortening the real duration of the rheumatism is very doubtful. That the salicylates do relieve the accompanying arthritis the soonest and best no one can deny, but the blood most highly charged with them is just as likely to inflame the heart as it is without them—just as rheumatism in childhood shows that there is no necessary connection between the severity of the joint-symptoms and the liability to carditis. Not so the alkalies. When they are given promptly and with the one object speedily to alkalinize the urine and to keep it alkaline, the heart may be reasonably regarded as safe from serious attack. For this purpose it is not enough simply to give alkalies, but a relative excess of alkalies in the blood and in the secretions must be secured, and to do this may require persistent and free dosing for prolonged periods. For this purpose I prefer Garrod's treatment, with 40 grains of the bicarbonate of potassium and 5 grains of citric acid, every two hours continuously till the urine is not only rendered alkaline, but remains so for twenty-four hours, when the same doses may be given every three or four hours, according to the tendency to revert to acidity. By this medication, when in adults the symptoms of rising fever and of the extension of joint-inflammations point to approaching heart mischief, we secure not only prophylaxis, but also may arrest a carditis already begun. Meantime, the alkaline treatment does not exclude the employment of the salicylates from the beginning for their analgesic effects, and therefore I long have been accustomed to prescribe the latter alone at the commencement of acute rheumatism, and then to diminish or to intermit their use so soon as heart-complications seem to be threatening.

Another indication in the treatment of acute endocarditis is to slow the beats of the heart itself. When we consider how insignificant the structural changes accompanying rheumatic inflammations are it is evident that another factor besides the rheumatism is needed to explain the severity of the heart lesions. A knee-joint with the same amount of pain and swelling from any other cause of arthritis would probably not fully recover therefrom, while in acute rheumatism it may part with its inflammation by transfer to another joint in one day. What that factor is which induces organic changes in the heart may be inferred from the contrast between the joint kept motionless

when it is attacked and the inflamed valve vibrating a hundred times and more a minute. This surmise is further borne out by the effects of the rheumatic inflammation in another unresting texture—the pleura; for rheumatic pleurisy resembles the cardiac more than the joint-inflammations in consecutive damage.

To quiet the heart in endocarditis aconite is the preferable sedative, for its specific analgesic property renders it superior to the simply slowing action of veratrum viride. Five drops of the tincture every three or four hours, according to the effects, will often cause a marked improvement in the heart-symptoms, and if there be much pain Dover's powder is an excellent adjuvant to the aconite. In those cases with quick, feeble pulse and grave general symptoms aconite is contra-indicated, and opiates with alcohol should be administered instead.

Another measure, often not as sufficiently attended to as its relations to such an inflammation require, is protection of the surface. While there is no direct vascular connection between the skin and the internal viscera, the general law of a close relationship between the vaso-motor nerves of an internal part and that of the corresponding cutaneous area has many important therapeutic applications. On this law are based not only the uses of counter-irritation, but also those of all external applications in the treatment of internal inflammations. The quick start of the heart in health on a sudden application of cold to the præcordium is an illustration of this sensory association. But in all inflammatory states of internal organs this normal sensitiveness to cutaneous impressions is much increased. A person with an acute coryza will know that a cold draught is coming from some source which he would be quite unable to appreciate in his usual condition. There can be no doubt, therefore, that an acute inflammation of the heart can be much aggravated by a neglect to protect the affected side of the chest from chill. It is rare to have that region laid bare in health, either by day or by night, and yet I have seen physicians expose the chest of perspiring patients with acute rheumatism and a carditis to an unjustifiable extent and time while making their examinations; and on one occasion, I doubt not, with fatal result in a case of commencing pericarditis, in order that a class of students might hear the friction-sound. We should pursue instead the opposite course, not only by providing a special covering for the surface over the cardiac area, but also by the sedative effect of moist heat along with a variety of anodynes. Poultices mixed with extract of hamamelis and laudanum, and covered with oil silk, could be used by day, while at night it is preferable to saturate a flannel with linimentum opii 4 parts and linimentum chloroformi and linimentum aconiti, each 1 part. I have also long found a recommendation of Dr. T. K. Chambers of great service, that all patients with acute rheumatic inflammations

should lie between blankets. This gives relief at once to the tender joints, whose hyperæsthesia is much aggravated by the rubbing of the sheets when wet through, as they often are, with acid perspiration, while the blankets serve much better than sheets to prevent further rheumatic inflammation or relapses from chill. I have no doubt that perspiration, especially at night, is a potent cause of intensifying or prolonging an attack of rheumatism.

The perfect protection of a patient with a rheumatic carditis from surface cold is therefore as important an indication as any other in his case; and for the same reason during the subsidence of the inflammation, when the heart remains irritable for so long a time, it is well to order a large belladonna plaster to cover the whole cardiac area. As remarked above, no case of carditis should be allowed to get up too soon. The progressive nature of the heart affection in this stage of subacute inflammation is too often illustrated by the after-history of those patients who cannot be persuaded sufficiently to avoid all influences which increase the frequency of the heart-beats.

In the treatment of the types of endocarditis described above, with grave constitutional symptoms, we have to rely mainly upon free alcoholic stimulation. Unless the temperature exceeds 103°, we may hope for benefit from 20-drop doses of the tincture of the chloride of iron. Quinine and the coal-tar derivatives are mischievous from their weakening effect on the heart. I had one case which seemed to improve remarkably from drachm doses of Labarraque's solution of chlorinated soda, given freely in milk and water. I was led to do this from my constant use of this medicine in scarlatina, and in which it also acts well on the cases with rheumatic symptoms. In the endocarditis occurring in acute nephritis frequent warm baths seem to do good, not only to the renal affection, but also to the cardiac complication by their sedative effect on the heart. German writers (Traube, Leyden, Franzel; and in England, Lees and Poynton) have drawn attention to a remarkable distensibility of the heart in acute rheumatism, indicating a softening of its walls by the action of the rheumatic toxin independently of any process of inflammation. The dilatation of the heart may be demonstrated by the extension of the percussion-area of dulness, while on the subsidence of the rheumatism the heart regains its normal dimensions. This explains the weakness and diffusion of the heart-impulse in many cases of severe rheumatic carditis which, ascribed to pericardial effusion, was found post-mortem not to have been due to this cause. As in all cases of mural softening of whatever origin, digitalis is of no avail to strengthen the weak pulse, and reliance should rather be upon caffeine, strychnine, opium, and ammonia or alcohol.

Malignant Endocarditis.

Instances of this severe malady are not of uncommon occurrence in hospital wards, but three cases in private practice afford good illustrations of its protean symptomatology, as well as of its more common types.

A lad of fourteen was brought to me as a case of chronic ague, with extreme anæmia, of five months' duration. Though repeatedly examined by myself and by more than one distinguished consultant, yet no cardiac murmur or other heart-symptom could be found to account for the transient appearance of reddened spots on different parts of the body, generally in the neighborhood of joints, whenever he had one of his severe chills with fever and sweating, and which occurred usually every seven days. During the intervals his temperature was normal or subnormal. At last a chill occurred which was followed by the rapid development of endocarditis, pericarditis, high fever, delirium, hemiplegia, and death. A localized ulceration on the left aspect of the ventricular septum was the probable origin of his disease, as it would account for the long absence of valvular signs.

The second case began with a follicular inflammation, which developed into small abscesses in the tonsils of a middle-aged gentleman, and which, as usual with him in former attacks, was followed after a week by rheumatic symptoms in his joints, though never before had his heart been involved. At this time he was under great mental depression, owing to financial losses, and he soon showed such serious symptoms of prostration and excessive sweating that the diagnosis of malignant endocarditis was early made, though the only heart-signs were pronounced disturbance of rhythm and rapid, weak pulse. He became obstinately taciturn, and, after developing double pneumonia, he died comatose. It was the right side of the heart which became affected first in his case.

The third case was that of a gentleman, aged sixty, with chronic sclerotic valvular disease and dilatation of the left ventricle, who, by proper treatment, had recovered a few months previously from pulmonary œdema and general anasarca; but after a dysenteric attack, induced by careless eating, his heart-symptoms suddenly became aggravated. General dropsy rapidly developed, with great dyspnœa, followed soon by cerebral symptoms, and then by a most extraordinary appearance of ecchymoses over the whole body. After death the universality of these hæmorrhages in even mucous and serous membranes, as well as in the parenchyma of the viscera, would suggest a sort of bacterial spray from the aortic orifice to account for them.

In this disease rheumatic antecedents are but rarely noted, and then, with few exceptions, only as long-past occasions of chronic

valvular disease. Long-standing organic heart-lesions, however, of whatever origin, especially congenital malformations, seem to be potent predisposing causes for developing the affection. Next come infective forms of pneumonia, with the further not infrequent complication of purulent meningitis. Next, traumatic infection from some external source, such as a slight wound in the foot from paring a corn, or from a furuncular inflammation, or from a phlebitis common in the uterus after abortion or in puerperal fever. In these the right side of the heart is first attacked, and the auricular surfaces of the mitral valves secondarily, with pulmonary complications as the rule. In some cases, however, the infective source is not discoverable. Nor can it be said that the microbic invasion has been demonstrated yet as of one specific kind, the commonest form found associated with purulent foci being the *Staphylococcus pyogenes aureus.* On the other hand, in many cases pus is found nowhere, either in the heart itself or in the affected tissues. The proposed name of "ulcerative endocarditis" for this affection will not cover all cases, as there are some in which no ulceration can be found in the heart. Usually, however, large fungous vegetations are found with extensive ulceration at their bases, or the ulcers may be clean cut and eroding, or perforating the valves or even the septum, or else by means of abscesses extending through the muscular parietes of the heart till a purulent pericarditis is induced. Meantime, the systemic symptoms are of all the varieties which the infected blood-current may induce in its circuit—sometimes pulmonary, sometimes cerebral, gastro-intestinal, renal, etc., rendering the diagnosis often a matter of guesswork, especially as these secondary affections may afford much more distinctive signs of their own than the heart itself does. The fever, when pronounced, which is not always the case, is of the pyæmic type, but in chronic ulcerative states it may closely resemble ague in its quotidian or tertian form, or, as in the case of the boy mentioned above, of the hebdomadal type. At other times it has the characters of a remittent fever.

Another type of this form of endocarditis is characterized by its relative chronicity. Thus, a gentleman, aged thirty-five, consulted me for a supposed ague of two years' standing. He had a daily chill at 4 P. M., with a temperature of 103° to 105° F., followed by sweating and a subnormal temperature in the morning. These attacks continued under my observation for four months, and the patient averred that they were no different from those which he had suffered from for ten months, and before that with intervals of freedom of a few weeks' duration. His blood on examination showed abundant streptococci, and he finally died with symptoms of acute hemorrhagic nephritis. He had a pronounced systolic pulmonary murmur, but he stated that he had carried it with him all his life, having been

born a blue-baby and continued cyanotic till his third year. Anti-streptococcic serum was freely tried with him without avail, his terminal nephritic symptoms developing shortly after its use. A second case, in a young man, has been under my observation for a year and a half, with a daily remittent fever ranging from 101° to 103° F., accompanied by a systolic pulmonary murmur. Autopsies of such cases often show extensive vegetations without ulceration, or pyæmic foci in the consecutive infarcts. In the first case described above, although the streptococci were found in the blood during life, not a single purulent collection was discovered in his body. As this disease can scarcely be otherwise than inevitably fatal, the treatment can be only palliative of the urgent symptoms.

Acute Pericarditis.

As fractures are classified by surgeons into simple and compound, not because the latter term implies more extensive or serious breakage of bone, but because a new element is introduced into the case by communication with the outside, so pericarditis may be termed simple when the pericardium alone is involved, and compound when there is *peri*-pericarditis as well; for the course and ultimate results of the affection are much modified by such extension in the majority of cases. Thus, complete obliteration of the pericardial cavity by the adhesion of its two layers is not infrequently found at autopsies, without much appearance of damage to the heart therefrom; but, as will be shown in speaking of chronic diseases of the heart, adhesions of the pericardium to adjacent parts, such as the chest parietes, or to the pleura, often lead to progressive structural changes which entail the severest results of heart disease.

Acute pericarditis is most commonly induced by the causes enumerated above as those of endocarditis, such as acute articular rheumatism, etc. A neighboring pleurisy—more commonly, therefore, of the left side—may also be added. But the pericardium has its own inflammation besides in the form of a tubercular pericarditis, which may be entirely primary, though usually it is associated with a general tendency to tuberculosis of the serous membranes. It is curious that tubercular pericarditis is more common among elderly than among young subjects. In this form, as well as in those cases which occasionally develop in the course of scurvy and purpura, the accompanying effusion is apt to be bloody. In rheumatic cases the effusion is serous or sero-fibrinous; in nephritis, more watery; while it is purulent in ulcerative endocarditis, pyæmia, and endocarditis from extension of an empyæma. If life be prolonged long enough in purulent pericarditis, the pus finds an outlet in the most various directions, as would any other abscess in moving parts. Finally, pericarditis may

be induced by chronic endocardial and aortic lesions, by new growths in the mediastinum or from the œsophagus, bronchial glands, etc., and by various traumatisms.

The temperature in acute pericarditis is not often high, ranging from 101° to 103°, and in chronic cases it may remain normal. At the beginning of the acute inflammation the changes are the same as in any other inflamed serous membrane. But ere long the rapid movements of the pericardium cause the exudation, whenever it is not quite fluid, to assume the "honeycomb," "shaggy," or "butter" membrane appearance, when the two layers are separated from each other, or it may show irregular rolls lying between free flakes. The effusion when liquid may be moderate in amount, or so abundant as to measure from a pint to a quart or more.

The symptoms of pericarditis depend upon the conditions, and hence the diagnosis may be either very easy or quite the opposite. When it occurs in acute rheumatism, for example, it may be only by auscultation that its presence is revealed. In the first stage, præcordial pain, as might be expected in the case of a tough membrane, is more pronounced than in endocarditis. When constituting more than uneasiness or tenderness the pain may be described as cutting, tearing, or burning, and sometimes as radiating to the left shoulder or down the left arm, and it is often accompanied with nausea or vomiting. The pain also leads to restriction of the movements of the diaphragm, so that, though the patient moves his legs freely, he keeps the trunk perfectly still. Locally, there is tenderness on pressure over the intercostal spaces and left side of the epigastrium. A short, hacking cough is frequently present, which if continuous should suggest the further complication of diaphragmatic or lateral pleurisy. The pulse remains strong, full, and excited even when effusion has set in, sometimes with a full and then collapsing quality resembling Corrigan's pulse; and it is diagnostic to find these characters while the impulse is enfeebled by the interference of liquid in the sac. When the effusion, however, becomes sufficient to embarrass the diastole, the pulse alters remarkably, and may become small and irregular. Palpitation meantime is very common.

In the first stage of pericarditis, however, it is by auscultation that conclusive evidence is obtained in the presence of the characteristic friction-sound. It may be heard most plainly where other murmurs are but rarely heard, as over the pulmonary artery at the base, or equally over both ventricles, but it distinctly fails to be transmitted in any direction away from the heart. Though double, yet its sounds are not exactly synchronous with either of the heart-sounds when these can be also heard, and it is more superficial than are endocardial murmurs. At first the friction-rub may be of a grazing character, then louder and

more crackling, like the crumpling of paper, or creaking, though very rarely musical. It also often varies with position, being clearer when the patient sits up than when lying down.

With the increase of the effusion the symptoms generally become much modified. The pain moderates and the murmur disappears. The breathing becomes labored and shallow; the patient lies with the head high, or he may have to sit up. The expression becomes anxious, the countenance paler and somewhat cyanosed, the pulse more rapid, smaller, and weaker, and in bad cases quite irregular. The veins of the neck are enlarged as a result of increasing stasis, and they may show many undulations. In some cases there may be pronounced dysphagia. Delirium is common, or the patient may become irrationally taciturn. The signs on physical examination are now dependent on the effusion. The heart-beat may hardly be detected by the touch, but be strikingly visible to the eye as diffused upward above the nipple, with a distinct undulatory movement. This is not due to the apex being raised, but to the impulse of the heart itself, transmitted through the fluid. The præcordial region is bulging, especially in children, the intercostal spaces widened or obliterated, with sometimes the further unfavorable symptom of cutaneous œdema, indicating probable diaphragmatic pleurisy. Percussion shows marked enlargement of the area of cardiac dulness, which may extend from the clavicle above to the diaphragm below, making a triangle with its obtuse apex at the sternal junction of the left first rib, one side passing downward through and beyond the left nipple, the other more vertically midway between the right nipple and the sternum, while the dulness is absolute over the sternum. Some points about the extension of dulness caused by pericardial effusion should be noted to distinguish it from dulness due to other causes, such as dilatation of the heart, aneurisms, mediastinal tumors, etc. Thus, Rotch's sign is the presence of dulness in the cardio-hepatic triangle on the right side, which sign may be a very early one. The base of this triangle is the horizontal line of liver-dulness drawn from the top of the infrasternal notch at the junction of the xiphoid with the sternum; the inner side of this triangle is formed by the right border of the heart. Pericardial effusion causes absolute dulness to replace in this area the modified pulmonary resonance caused by the lower angle of the lung overlapping the liver; and that this dulness is due to distention of the pericardium, and not to enlargement of the right auricle, is shown by the third line of the triangle forming an acute angle outward with the base-line, and not a rounded line turned inward toward the sternum, as it would do if the space was encroached upon by a dilated auricle. This difference should be borne in mind, because there are several recorded instances of a dilated

right auricle having been punctured by mistake for a pericardial effusion. In cardiac dilatation on the left side the apex-beat is found outward and downward at the limit of the dulness; in pericardial effusion the apex-beat is in its normal situation well within the outer limit of the dulness, where it can be heard if not palpable. Marked pericardial effusion depresses the liver, so that its upper border is felt under the tip of the xiphoid, and often causes a protrusion of the epigastrium. A change may also be noted in the line of the left first rib compared with its fellow on the right, and the upper border of that rib can be traced between it and the clavicle. Ewart claims that a pathognomic sign of pericardial effusion can be found posteriorly, in a square-shaped patch of dulness on the left side at the extreme base of the lung and the spinal column, extending from the twelfth to the tenth rib. Bamberger's is a valuable sign when present. It is a patch two inches in diameter near the angle of the left scapula, where tubular breathing and œgophony may be heard. Sometimes pericardial effusion when very extensive may be mistaken for effusion into the pleura, but a pericardial effusion would not extend below the eighth rib, while a pleuritic effusion certainly would. An important sign in moderate effusion is the modification of the boundaries by change of posture, increasing transversely when the patient sits up and diminishing when he lies down; and it is further significant that the dulness extends beyond the position of the apex-beat. If the pericardial murmur continues now in any form, it is changed into irregular jogs, which are more numerous than the endocardial sounds, which may be distinctly heard, though distant and muffled. In fatal cases the failing pulse may seem to be suspended during inspiration or cough, while restlessness, especially of the arms, rambling, or maniacal delirium, and lastly—particularly in rheumatic cases—convulsions and coma, terminate the scene.

Recovery from pericarditis often occurs more rapidly and completely than from endocarditis, the whole course lasting not more than a week, and leaving no signs during the subsequent life of the individual. In other cases the absorption of the fluid is more gradual, and as its components solidify the friction-rub returns louder and coarser than before, so that a friction fremitus may be felt by laying the hand over the part. More pain may now again develop, with palpitation, but, as a rule, the gradual diminution of all symptoms is progressive, till, by more complete adhesions forming between the two layers of the membrane, the friction-rub itself disappears. The exudation becomes in time converted into an imperfect form of connective tissue, which may be thin and delicate or thick and tough, or even extensively calcareous. There are no means of certainly diagnosticating such simple

adhesions during life, for, unlike external adhesions of the pericardium, they rarely give rise, except in the calcareous form, to definite disturbance of the heart's functions.

Treatment.—The dangers of the attack itself are greater than in endocarditis, and are due in the first place to the amount of compression of the heart by the effusion; secondly, to the greater tendency of pericarditis to involve the heart-muscle; and lastly, to the liability of extension of the inflammation to the pleura or lungs.

The indications, therefore, are to moderate the inflammation as soon as possible; and here, as in endocarditis, the rapid action of the heart is to be regarded as the inevitable and yet serious complication of the inflammation, and therefore it is the first thing to attend to. Pain is the leading cause of both the excited and the irregular cardiac beats which constitute the symptom of palpitation. Hence in the first stage of the affection, when the pulse is full and strong, opium and aconite are invaluable, and should be given in full doses according to the age of the patient. When the effusion begins to tell on the circulation, they should be given up. Hot anodyne fomentations covered with oiled silk should likewise be assiduously continued until the symptoms of the second stage begin, when they too should give place to the application of mercurial ointment with a flannel under the oiled silk covering. This old-fashioned remedy is of real service, in my opinion, throughout the subacute stage of the inflammation, and for a long time afterward in cases of external adhesions. In the acute stage German writers generally advise the application of the ice-bag. My experience with it has not been favorable after giving it a fair trial in hospital practice. When the effusion weakens the heart, digitalis and stimulants, like drachm doses of Hoffman's anodyne, with whiskey or brandy are required. The pulse-characters should be our guide rather than the signs of effusion alone, for accompanying myocarditis may be the cause of the flagging pulse and of the cyanosis, while the area of cardiac dulness may be but moderately increased. All except the most necessary movements of the patient should be avoided, for it is often noticeable how long the increased frequency of the heart-beats continues after such exertion as sitting up occasions, and which, when the pulse is irregular, may cause fatal syncope. When the effusion seems stationary, and not before, a blister to the whole præcordial region is often very beneficial, but it should not be prescribed in nephritis, for the tendency to effusion then is not from the local inflammation only, but is part of a general condition. In rheumatic cases the alkaline treatment should be persevered with, but all salicylates stopped.

If, however, the symptoms due to the effusion increase, an exploratory introduction of a hypodermic needle should be made, with

proper antiseptic precautions, in the fifth interspace near the sternum, but not too near, on account of the internal mammary artery. This preliminary operation is needful, for we cannot be certain otherwise of the degree of removal of the heart from the chest-wall by the fluid. If fluid be withdrawn readily, we then can use the aspirator without fear; and it is often striking how a moderate abstraction suffices to improve the whole aspect of the case. Experience has shown that the dangers arising from puncture of the heart itself are but slight. For purulent pericarditis nothing else than evacuation of the contained fluid can be done, and if the aspirator fails a proper trocar and canula should be used.

The after-treatment of pericarditis should be according to its exciting cause. Restoratives of all kinds are indicated, except that in every form of rheumatism iron is mischievous, while in nephritis it does good combined with tincture of nux vomica and sweet spirit of nitre. It is only in convalescence that the iodide of potassium has seemed to me beneficial; it should be given in small doses, not more than 5 grains, and long continued. I have thought that it allays a tendency to palpitation, and I give it in combination with the tincture of belladonna. Nothing, however, so quiets the heart and improves the symptoms of patients convalescing from any form of carditis as to have them wheeled out in mild weather to spend hours on a porch or verandah.

Tubercular Pericarditis.

This affection may develop suddenly as a primary disease, but otherwise it is not always easy to make out its existence. The effusion is often bloody, as previously stated, and the exudation may be so soft that it produces no positive sound. The patients very commonly have tubercular pleurisy as well, and in any case this form of pericarditis is prone to become complicated with external adhesions. If cardiac symptoms, such as great weakness of the pulse, cyanosis, and more dyspnœa than the pulmonary lesions will account for, develop in patients with well-marked phthisical tendencies, we may suspect tuberculosis of the pericardium and watch for the signs of effusion, etc. The application of a blister is indicated in this form particularly, while the case is otherwise treated according to the special symptoms present.

Hydro-pericardium.

Simple dropsical accumulation in the sac, without inflammation, does not occur as an isolated affection, but in conjunction with similar collections in other serous sacs, and therefore most commonly in chronic Bright's disease with anasarca. I have seen it, however, quite pronounced when there was but a moderate collection in the adjacent pleura. It may then have occurred as the result of a low grade of

inflammation which was not enough to affect the temperature. The treatment should be that followed for the general disease, together with the local application of mercurial ointment.

Acute Myocarditis.

This is a very different affection from the so-called chronic myocarditis or chronic fibroid disease of the heart, and it consists of a true acute inflammation of the muscular walls, so that the fibres become softened, and under the microscope show the characteristic changes of inflammatory processes in muscular tissue. It is a not uncommon accompaniment of acute pericarditis, and to a less degree of endocarditis, but it is then generally limited to the muscular fibres most adjacent to the inflamed membrane. As previously mentioned, it may consist of a localized extension of ulcerative endocarditis, with abscess-formation, but in any case this associated myocarditis is not recognizable by physical signs, and can only be inferred by its occasioning more weakness of the heart's action, with dyspnœa and cyanosis, than the primary disease seems to account for. Acute myocarditis, however, undoubtedly does occur in some cases by itself without either endo- or pericarditis, as has been shown by G. West in England, and Koster, Ruehle, and Leyden in Germany. The cases reported, with confirmation by autopsy, mostly occurred in connection with acute rheumatism, or else were associated with cirrhosis of the liver in drunkards. The symptoms during life which led to the diagnosis were accompanying acute rheumatism with serious heart symptoms, without signs of valvular or pericardial implication, or without rheumatism, yet with the same symptoms of great cardiac dyspnœa, cyanosis, weak heart-action, and delirium. As cirrhosis of the liver is particularly apt to be accompanied by degeneration of the muscular tissues generally, it is probable that this condition may occasionally take on an acute form in a heart previously weakened by alcohol, but the frequent presence of acute rheumatism in the cases reported leaves no doubt that a true primary myocarditis may be set up independently in rheumatic fever; and Ruehle claims that this happens oftener than is generally supposed. That myocarditis may be the chief cause of the fatal course of a rheumatic endo- or pericarditis is readily granted, but as a separate affection it certainly is not common in this country. The recognition of its possible existence, however, is serviceable if only to prevent a too exclusive reliance on physical signs in the diagnosis and prognosis of heart affections. The absence of murmurs or of increased area of dulness on percussion should not cause us to rest easy in the presence of cyanosis and of failing, irregular pulse. The treatment of this affection is of course the same as that of like conditions in other cardiac inflammations.

Acute Myocardial Degeneration.

I prefer this term to denote the serious changes in the heart-walls caused by certain toxins, notably that of diphtheria, because they are not primarily of an inflammatory character, but seem in diphtheria to be due to the direct proteolytic action of the poison secreted by the Klebs-Loeffler bacillus. In the more prolonged cases, which may last a week or more, the pulse becomes small and feeble, and, what is of particularly unfavorable augury, irregular. It may be either frequent or infrequent. The temperature falls remarkably; it may be 95° F. in the rectum, and the surface is cold. The face becomes very pale, and wears an ominous expression of approaching dissolution, sometimes accompanied by very distressful breathing. The sense of prostration is extreme, and yet the limbs retain considerable power, showing that the weakness is locally cardiac. The consciousness is retained to the end. In other cases the symptoms of collapse come on very suddenly, and death may follow in a few hours. Others die in syncope without previous warning. The toxin seems to have a special action on the muscular tissue of the heart and on nervous tissue, so that it is possible that some cases of heart-failure may be chiefly owing to dissolution of the intrinsic nerves of the heart, which late researches show to be extraordinarily numerous, rather than to an action on the vagus. Similar changes sometimes occur in the heart-muscle in croupous pneumonia, and may be the cause of sudden death in that disease. Two remarkable cases of bradycardia in pneumonia may be cited, one with a pulse of 30 and 104° F.; the other, pulse 45° and 104.6° F.: in each case lasting over a week: both recovered. The marked debility of the heart in typhoid fever, on the other hand, is not usually due to fatty degeneration. The symptomatic treatment of cardiac failure in diphtheria is fearless dosing with alcohol. Jacobi recommends in children a pint of whiskey or more a day.

CHRONIC DISEASES OF THE HEART.

A chronic structural change in the heart resulting from an acute process is not always synonymous with chronic heart disease. Thus acute endocarditis occasions a variety of changes in the mitral and aortic valves which long may indicate their presence by their characteristic murmurs, and yet in time these may wholly disappear. That many such cases outgrow the valvular trouble, especially mitral lesions, there can be now no doubt. The majority even of those in

whom valvular murmurs permanently continue do not have their health unfavorably affected for years, and in many of them the duration of life is not appreciably shortened. Sir Andrew Clark reports 684 cases of chronic valvular lesions in his own experience which had been observed for five years, without the health having been disturbed by the state of the heart. An old valvular damage, however, soon becomes a serious matter when certain influences or states begin to strain the heart, and hence in no class of diseases is it so important to take account of the general, in distinction from the special or local, conditions as in chronic diseases of this viscus. Thus, judged by post-mortem appearances alone, it may be difficult to decide whether the valvular changes were the chronic results of acute processes, or were caused by acute processes supervening upon chronic lesions. But the clinical history and aspect of the case will afford valuable assistance toward estimating the share of intra- and extra-cardiac influences in producing the symptoms, as well as their order in time; and hence we prefer to classify the various chronic affections of the heart into the primary, or those caused by some lesion in the heart itself, and secondary, or those which are produced by disorders of the circulation.

Chronic Valvular Disease.

Chronic primary valvular disease may arise from an endocarditis during fœtal life, the right heart being then liable to attack, as previously stated; so the commonest congenital form of valvular heart disease is either incompetence or stenosis of the pulmonary valves. As articular rheumatism, chorea, and scarlatina are commonly affections of childhood or of youth, so primary valvular heart disease oftenest occurs before thirty years of age, to give place then to progressive liability to the various forms of secondary valvular disease. Of the primary forms, mitral incompetence is the most frequent, mitral stenosis next and almost as frequent, aortic incompetence next, and aortic stenosis next. Of combined lesions, mitral incompetence and mitral stenosis is the most common, aortic and mitral incompetence next, and aortic stenosis and mitral incompetence next. In the right ventricle tricuspid incompetence is very common as a result of advanced valvular disease of the left heart leading to overdistention of the right ventricle, particularly mitral stenosis, but it may be caused by changes in the lung in chronic bronchitis and emphysema. Tricuspid stenosis is sometimes associated with mitral stenosis, while lesions of the pulmonary valves not congenital are rare. In the order of seriousness there is little difference between them, when the valvular damage itself is moderate; but when it is considerable, the worst valvular disease is aortic incompetence, especially when it develops late in life, mitral stenosis next and the worst in early life, aortic

stenosis next, and mitral incompetence last. As the chronic inflammatory processes induced through the imperfect working of the valves by the initial inflammation scarcely can be limited to only one aspect of the valves, so it is very common to find them result in both stenosis and incompetence of the affected orifice. Thus, mitral stenosis may begin with an inflammation of the auricular surface, which unites the edges of the two segments by a growth of connective tissue, sometimes infiltrated also with calcareous matter. This process, however, may extend to the chordæ tendinæ below, and mat them together into a fibrous cord whose contraction draws the valve down into a funnel shape with a small slit in it, constituting the "buttonhole" mitral, reducing its opening to one-third its normal size. But, on the other hand, the effect on the chordæ tendinæ may be the reverse of this, for they may become so elongated that they allow the valves to flap back, with consequent regurgitation into the auricle. Other contraction changes in the valves may keep them open, and yet narrowed in both systole and diastole, with the production of double murmurs accordingly. The sigmoid valves of the aorta may undergo the same changes, so that aortic regurgitation is very commonly preceded by a stenotic murmur. The valvular changes in aortic incompetence, as a rule, are more extensive than in other forms of valvular disease, owing to the great force of the recoil of the aorta, especially as this increases with age. The slow inflammatory process may then extend to the aorta itself, and with aortic dilatation we may find a valve so thickened and distorted that it is turned into the semblance of a large vegetation flapping back and forth in the blood-stream, with a distinct musical vibration.

The effects of these lesions will vary, of course, according to the valves involved and the extent to which they are altered. The systemic effects of mitral lesions are ultimately those of failure of the right or venous side of the heart, with the intermediate stasis of the pulmonary circulation added. In a case of primary disease of the right heart from pulmonary emphysema and old bronchitis the liver becomes chronically engorged, so that its lobules show the "nutmeg" appearance caused by a white zone of fatty cells enclosing red-and-yellow-looking tufts of hepatic and portal capillaries and distended bile-ducts. It is this condition of the liver which gives the yellow tinge to the complexion of such heart-disease patients. As a further result of portal embarrassment there are also gastro-intestinal symptoms, such as flatulence, anorexia, and heaviness after eating, constipation, and hæmorrhoids. The urine is diminished in quantity from a like condition of the kidneys, but it is important to mention that it may be quite albuminous, with numerous casts. The albuminuria and the casts may soon disappear with the improvement in the heart. The

enlargement of the liver affords, besides, an indication that the kidney affection is not primary, but is due to the embarrassment of the heart; for in cases of original Bright's disease associated with consecutive heart disease the liver is not much enlarged, if at all. Finally, the increasing venous stasis tells upon the external circulation. The ankles begin to be œdematous; then the dorsum of the foot; and an ascending dropsy ere long reaches the body, with ascites and general anasarca, from which the face may or may not be wholly free, according to the state of the kidneys. These disorders in the return circulation may follow disease of the right heart alone, the left cavities then being small and contracted because of the diminished flow from the lungs, so that the general arterial circulation is relatively lessened, with a correspondingly small pulse. It is, however, a more curable state than disease of the left heart, for the right heart both dilates and recovers from dilatation more readily than the left does. Hence the prognosis is more serious, if the right heart fails from disease of the left, when the pulmonary stasis against which it has to contend is of mitral origin. In mitral stenosis especially the engorgement may be so great, with paroxysmal exacerbations, that a profuse hæmoptysis may occur, and blood be found after death effused in small scattered or in large masses in the lung-tissue itself. For some unexplained reason, these collections of so-called "pulmonary apoplexy" occur oftenest at the base of the right lung. A longer stasis may block the capillaries, so that the alveoli become almost obliterated, causing the dense heavy condition termed splenization of the lung, while a more chronic state still induces interstitial growth of connective tissue, thickening of the alveolar walls, deposit of pigment, varicosity of the veins, and atheroma of the pulmonary arteries, producing the appearance to which the terms "brown induration" or "brown indurated pneumonia" are given.

In mitral stenosis the pulse is characteristically small, and in bad cases irregular as well. The diminished quantity of blood in the left ventricle generally causes it to be small and contracted. If it be found hypertrophied instead, the presumption is that mitral incompetence occurred first, during which the ventricle enlarged, and that the stenosis developed afterward. The right ventricle, on the other hand, is always enlarged to compensate for the obstruction in the pulmonary circulation, so that with the smallness of the left ventricle the right may extend to the normal position of the apex-beat, causing the characteristic stenotic murmur to be heard more toward the middle of the sternum.

Mitral incompetence may be caused by the structural changes above mentioned, or simply by the general distention of a dilated left ventricle. This may occur, as Donald McAlister has shown,

enough to allow of considerable regurgitation during life, and yet the mitral valves themselves be found normal after death, owing to the fact that the mitral opening is not surrounded, like the aortic, by a strong fibrous ring, but by fibrous tissue, which thins out from its origin in the fibrocartilage of the heart till at the opposite side of the orifice it is practically non-existent. There is, therefore, nothing to keep the mitral opening rigid, and hence by the contraction of the circular fibres of the ventricle during systole the orifice is narrowed independently of the valves. As with each systole a part of the blood regurgitates into the auricle, the latter chamber becomes distended with the blood received both from the lungs and from the ventricle; and hence with the succeeding diastole a larger quantity of blood than normal flows into the ventricle. This entails heavier work on the ventricle, and leads to its hypertrophy; but unless the regurgitation be too great, the blood sent into the aorta, if there be no stenosis there, is fair in amount and the pulse remains normal, but without tension, as this is prevented by the mitral reflux. So long as the right ventricle by its increased strength keeps up the resistance in the left auricle to the mitral regurgitation, the heart may go on filling the aorta so regularly, and the pulse be so natural, that this condition may last for an indefinite time without any sign save the mitral murmur to indicate its existence. Whenever the incompetence of the mitral, however, so increases that the right ventricle fails to balance it, or when the latter itself yields and dilates in turn from such an added strain as a bronchitis, then primary mitral valvular disease shows all the results above described of venous embarrassment in the lungs and throughout the system generally.

Aortic stenosis is a common result of acute endocarditis, but is usually then not sufficient to produce serious obstruction to the circulation, as compensatory hypertrophy promptly follows and the pulse remains normal in most of its characters. It is quite otherwise in the chronic endocarditis of secondary valvular disease, especially in elderly patients, for the aortic orifice may have become very much narrowed by the thickened and sometimes calcareous valves. Besides shortness of breath on exertion, the patients are often troubled with severe anginoid pains, or with attacks of faintness with sleeplessness and terrifying dreams. These pains may be remarkably relieved as soon as the mitral begins to give way and thus lessen the intraventricular pressure. In the aortic constriction of old age the pulse may be very intermitting, small, and particularly slow, sometimes only from twenty-five to forty a minute. There may then develop symptoms of cerebral anæmia, such as vertigo, syncopal attacks, or epileptiform convulsions, which differ, however, from true epilepsy in being accompanied by a remarkable fall of bodily temperature. In both

mitral and aortic stenosis, as well as in aortic incompetence, the imperfect supply of arterial blood leads very commonly to a general lowering of nutrition or emaciation, which presents a striking outward contrast to the swollen contour of patients with venous engorgement.

Aortic insufficiency may result primarily from endocarditis, and secondarily from chronic atheromatous or calcareous changes, spreading to the semilunar valves from the intima of the aorta. It may also follow upon overstrain, and hence does not occur among women as often as among men, especially those who have to lift heavy weights in their customary work. As previously remarked, the powerful recoil of the aorta tends besides to aggravate the reflux into the left ventricle during diastole, and as the quantity of blood thus accumulating in the ventricle from both its orifices is, on that account, constantly great, the tendency to hypertrophy and dilatation is the most pronounced in this of any of the valvular lesions. Secondary incompetence of the mitral valve is therefore very likely to occur, and, as this soon leads to hypertrophy of the right heart, the whole organ often grows to such a size in all its cavities as to merit the term "bovine," or ox heart. The effect of this condition of the left ventricle on the circulation is peculiar. The initial yielding at the origin of the aorta paralyzes the arterial tonus throughout the body; the great fulness of the ventricle causes an abnormally large amount of blood to be thrown into the aorta with each systole, whose unresisted wave can then be followed to the smallest arterial terminals. If the arm be flexed at the elbow, the brachial artery may be seen to move in its sheath along four to eight inches of its course. Even the color of the nails may be seen to vary with the pulse, especially on raising the arm, and an erythema of the skin produced by friction may similarly change its tint. Meantime, the large but very short pulse-beat, followed quickly by a sensation of collapse caused by the regurgitation into the ventricle, constitutes that characteristic variety to which the name of "water hammer," or Corrigan pulse, has been given. Such patients sometimes complain of anginose pains, referred to the region of the heart or radiating to the left shoulder and arm; but the irregularity of the arterial flow is most felt in the cerebral circulation, especially on suddenly rising, when sensations of giddiness come on, or dimness of vision, or syncopal attacks which may be quickly fatal. On the other hand, it is not uncommon for patients to live many years in active life without material discomfort and with a healthy look, for not until mitral incompetence complicates the case is the complexion changed.

Stenotic valvular disease of the right heart is uncommon except as a congenital affection. Secondary tricuspid incompetence, however, is a frequent result of mitral lesions, and, as is usual with strained

valves during the development of dilatation, the tricuspid may show signs of recent endocarditis at autopsies. The chief indications of the presence of tricuspid reflux are the systolic tricuspid murmur, whose point of greatest intensity is at the left edge of the ensiform cartilage, a visible venous pulse in the jugular veins, especially the right, and sometimes a palpable pulsation in the liver, to be felt by placing one hand on the epigastrium and the other in the right loin, when the whole organ seems to throb, probably because the liver veins have no valves, and thus easily transmit the cardiac regurgitation.

The symptoms due to the systemic effects of the heart lesions which have been described should always be noted first, before physical examination of the heart is resorted to, because they not only serve as guides to interpret the latter, but they may settle the nature of the case when the physical signs are relatively obscure or wanting. Systematic examination of a case of heart disease, therefore, should begin with the signs to be appreciated by the eye, then those which are detected by the sense of touch next, and those by the ear last. We should at first look the patient over. Simple anæmia and emaciation may imply pure mitral stenosis or aortic incompetence; extreme anæmia with ecchymoses, severe or malignant endocarditis. In chronic myocardial degeneration there is a peculiar paleness of the face, especially evident upon emotion or movement, and which may underlie a superficial or mottled redness of the cheeks. A yellowish tinge of the countenance and of the conjunctiva goes with tricuspid regurgitation, secondary to mitral disease or to chronic bronchitis, and this is still further assured by seeing the veins in the neck traversed by wavy pulsations. Entire absence of lividity suggests uncomplicated aortic lesions. A bluish tinge, especially of the lips, indicates failing propulsive power in the heart, which may be due to simple over-distension, to myocarditis, to the pressure of a pericardial effusion, or to mitral stenosis or incompetence. Visible arterial pulsation, especially at the bend of the elbow, is almost decisive of aortic incompetence. Œdema, beginning at the feet, indicates primary or secondary failure of the right heart as the origin of the dropsy, while its absence from the face suggests that the kidneys are not yet affected. Inspection then notes the presence or the absence of the characteristic cardiac dyspnœa, with the consequent great difference in prognosis. Dyspnœa due to any form of pulmonary derangement, whether in the respiratory passages, lungs, or pleura, is invariably accompanied by a local or general interference with the lateral and antero-posterior movements of the ribs in breathing, and with an increase of the vertical movement instead. But in cardiac dyspnœa the ribs can move naturally, and the patient acts as a person out of breath from running. The patient therefore does what he never does with any form of pulmonary dyspnœa—holds his breath

from time to time to restore the rhythm between the action of the heart and the respiration, to the derangement of which his dyspnœa is due. He often closes his mouth to do this, whereas if he strives to check his breathing from pleuritic pain the mouth remains open. Orthopnœa is always due to bilateral embarrassment, and hence is absent in unilateral pleurisy, pneumonia, and phthisis, but present in croup, bronchitis, and asthma. It is therefore also present in severe cardiac dyspnœa, but the mobility of the chest at once distinguishes it from asthma or bronchitis. Finally, it may be regarded as a general law that when dyspnœa is caused by muscular exertion, it is far more indicative of cardiac than of pulmonary derangement. The signs accompanying the cardiac movements proper should then be looked for. There may be no apex-beat visible, or it may be displaced from its normal position an inch below and within the left nipple, to the right by a pleuritic effusion, or upward by abdominal distension, or it may be extended downward and outward by enlargement of the left ventricle, or to the right with epigastric pulsation in pulmonary emphysema, and by enlargement of the right ventricle, or it may extend upward above the nipple with a wavy appearance in dilatation of the left ventricle, and especially in pericardial effusion, while in extrapericardial adhesions a remarkable alteration may be visible in a systolic retraction of the intercostal spaces and of the end of the sternum. Inspection then of the shape of the præcordium may show a uniform enlargement in all directions in pericardial effusion, amounting to true bulging of the part, sometimes with obliteration and widening of the intercostal spaces. Bulging may also be observable in the bovine heart of aortic incompetence in young subjects, but is rare in other forms of hypertrophy.

Palpation should be begun with one finger at the apex, and the finger should then be carefully passed over the whole cardiac area to find the first sign of a thrill. The detection of one is a valuable aid to diagnosis, as its relation to the movements of the heart is more readily made out by the sense of touch than the rhythm of a murmur is by the ear. Thus the apex-thrill of mitral stenosis is easily felt to precede and stop with the apex-beat. The point at which a thrill is most sensibly felt should be carefully noted, and then in what direction it does or does not continue to be felt. The conclusions from such palpation are quite as certain as those which auscultation affords, and the signs may be found either with the systole or before it at the apex, with the same limits or tracks of conduction as the corresponding mitral murmurs, or with the systole or diastole at the base transmitted into the aorta or down the sternum as basic murmurs are. In some stages of pericarditis a friction fremitus is best felt by the hand laid on the part.

Palpation also conveys much information with reference to the

heart-impulse. Though widely visible in pericardial effusion and in pronounced dilatation, it is much less appreciable by the hand in these states. The contrast then with the push of a strongly hypertrophied heart weighs much in the diagnosis of effusion or in the prognosis of dilatation. The impulse in simple dilatation is often quite peculiar, more like a slight slap than a direct stroke. In advanced cases of aortic incompetence the apex-beat may seem double, but it is soon perceived that the second stroke occurs during the diastole, and is the jog of the regurgitant stream from the aorta impinging against the ventricular wall, where, after death, a network of reticulated tissue is found developed on the spot which received the impact. On the other hand, the absence of impulse, either visible to the eye or sensible to the touch, and associated with a weak pulse, may be the only physical signs for the diagnosis of muscular degeneration of the heart.

Percussion does not render as much service in the examination of the heart as in the case of the lungs. This is due to the smallness of the area of the heart, which is not covered by bone or by lung-tissue, and, further, because the left lobe of the liver below gives the same note on percussion as the heart itself. Only the positive percussion indications, therefore, can be accepted, as noted above in pericardial effusion, for absence of increased area of percussion dulness does not prove by any means that hypertrophy or dilatation is not present. As Fagge remarks: "One may find at the autopsy of a case of cerebral hæmorrhage an enormously hypertrophied heart, notwithstanding that a few hours previously it may have been impossible to detect any clinical evidence of such a condition, the organ having buried itself within the hollow of the left lung, so as not to come more widely in contact with the chest-wall than in normal circumstances." Fraenzel also says: "Percussion of the heart permits no conclusion with regard to hypertrophy. In the normal individual, in the most favorable event, we obtain dulness at the upper border of the third rib at the left edge of the sternum, which extends downward occasionally to the lower border of the sixth rib. Externally, this dulness extends, at the most, to the left mammary line. Only occasionally can the lower border be distinguished from the hepatic dulness. But in the normal state of the heart even these limits are rarely reached in all directions. But if they are exceeded, while at the same time we can exclude disease of the adjacent organs, then the increased area of dulness must be attributed to an affection of the heart itself. If the dulness is increased in all directions, there is probably an accumulation of fluid in the pericardial cavity: in enlargement of the right ventricle there is increased dulness in that direction, and downward and to the left in enlargement of the left ventricle."

The method of percussion, however, has much to do with the infor-

mation obtained. Only very light percussion gives trustworthy results, and the stroke on the pleximeter finger should be made on the nail. Using the middle finger-nail for this purpose at a spot of marked dulness, the stroke can then be made for comparison on the nail of the ring finger, moved from and to the fixed middle finger. In this way the gradations of resonance can be easily appreciated, and the change noted in the outer limits of the area caused by holding the breath after a deep inspiration, and then after expiration during the percussion. In many persons, however, with large, full chests, still more when the lungs are emphysematous, the heart is too much removed from the chest-wall to render percussion of much avail.

From the date of the discovery of auscultation physicians have grown accustomed to regard it as the great and chief means of diagnosis of disease of the heart, on account of the accuracy of its indications. So it still is, but it is a mistake to consider it as all-sufficient. Its signs may be quite misleading, as when typical murmurs exist during life in a case of simple distension of the left ventricle in Bright's disease, but in which the valves may be found, post-mortem, quite healthy. Leyden says that loud murmurs are of better prognosis than feeble ones, and often the worst cases are those where auscultation fails altogether. It is, moreover, of much importance that auscultatory signs should be observed in a systematic order, so as to note the easiest determined first and the most difficult last. Thus, to a beginner it may well be embarrassing to settle the rhythmic succession of the sounds which he hears. Instead of the 14 to 16 respiratory sounds a minute of pulmonary auscultation, he may have, in a case of combined endo- and pericarditis, 72 murmurs replacing the heart-sounds in the same time. When to this element of number irregularity of rhythm is added, it is plain that the relations of the sounds or murmurs to the systole and diastole respectively may be impossible to decide without previously obtaining the aid of the other elements in auscultation. The first observation to note, therefore, when a murmur is detected is the exact locality where it is heard plainest. If more murmurs than one are present, then where each of these is heard plainest should likewise be settled, for this often decides not only that there is more than one murmur, but what kind of murmur the one first noted is. The next step is thus made easier—viz., to determine in what directions the murmur is or is not transmitted. With these two points well determined, the question of rhythm then nearly settles itself.

Mitral murmurs have the apex for their region of greatest intensity. An apex-murmur which is conducted to the left, under the axilla, and is likewise plainly audible at the left of the spine about the second dorsal vertebra, while it grows less distinct toward the base of the heart, is, without doubt, a systolic regurgitant murmur. A

tricuspid systolic murmur may easily be mistaken for it, as it often extends to the apex, but it does not go beyond it as the mitral systolic does. Musical murmurs are in the great majority of cases mitral systolic. But an apex-murmur which is not transmitted in these directions, but grows less distinct toward the axilla and toward the base, and whose point of greatest intensity is just within the apex, is most likely the presystolic murmur of mitral stenosis. This might easily be mistaken for an aortic diastolic murmur, as this may be transmitted to the apex, and, moreover, both these murmurs occur during the diastolic period; but the seat of greatest intensity of the aortic diastolic is never at the apex, but down the sternum, or even at the base, and it is generally heard also in the aorta. The two mitral murmurs differ also, as a rule, from each other in other respects. The stenotic is rather harsh or grinding, but ends abruptly with a click, which marks the systolic closure of the valve, while the systolic murmur of mitral incompetence is soft, or at most blowing or booming, in its note. With both these murmurs it is significant of the embarrassment of the pulmonary circulation to find the note of the second sound of the semilunar valves of the pulmonary artery at the left of the sternum sharper than those of the aorta more to the right. In some cases of mitral stenosis, or even in emphysema, the pulmonary valves cannot close as soon as those of the aorta, and we have a reduplication of the second sound, best compared to the double rebound of a hammer after the first stroke on a hard surface. A reduplication of the first sound is sometimes heard at the apex in cases of aortic obstruction or of high arterial tension from kidney disease. It is of unfavorable import, as indicating failure of the left ventricle. A mitral stenotic murmur often varies in intensity, being louder if the patient is sitting up than when lying down, or according to the rapidity of the heart-beat. Its frequent disappearance as the patient advances in age or in disease has been the subject of some fanciful explanations, but it seems most natural to refer it to the supervention of tricuspid regurgitation, causing the right ventricle to lessen the force of the current through the lungs to the left auricle. An aortic stenotic murmur is easily recognized by its site of greatest intensity being the base, and then by its transmission to the aorta at the second right costal cartilage, and thence up the carotids. It is then also plainly synchronous with the heart-beat. A diastolic aortic murmur has its point of greatest intensity just below the base of the heart at the mid-sternum, and is transmitted either directly down the sternum or a little to the left. It is also transmitted into the aorta, but, of course, not so plainly as the systolic murmur. Its rhythm is more easily made out than the diastolic murmur of mitral stenosis, for it begins

immediately after the systole ends, and occupies the whole diastolic period. When a double aortic murmur is found, the louder the first or systolic sound is of the two the better the prognosis, although if the diastolic murmur be prolonged it may not show so much disease as when it is very short, for this may mean that the blood is falling back into the ventricle with great facility.

Auscultation should also take note of simple modifications of the natural sounds. A weak first sound at the apex, with a too clear second sound at the base, is one of the signs of failing heart, as in fevers, the first sound being feeble because the ventricle is contracting feebly, while its quick relaxation causes the semilunar valves to flap back suddenly with a short snap. If only one sound is heard in fevers, it is the second sound. On the other hand, these signs are closely imitated in the cardiac hypertrophy of Bright's disease or in general arterial sclerosis. The difference is that the first sound in hypertrophy is muffled and prolonged, owing to the long stroke of the ventricle in forcing the blood into the over-full arterial system, while the short, sharp second sound is caused by the strong recoil of the distended aorta. The difference is further made more evident by the complete contrast between the impulse of the apex-beat and the opposite qualities of the pulse in the respective states. In dilatation a prolonged first sound is more favorable than for the second sound to follow immediately upon the first, for this indicates a ventricular weakness verging toward collapse.

Murmurs at the valvular orifices of the right heart are infrequent, and, with the exception of tricuspid regurgitation, are commonly congenital. Dr. Bradford Fenwick has collected 70 cases of stenosis of the tricuspid, with presystolic murmur, the majority of which were in young women who also suffered from mitral stenosis. The murmur was heard best over the fifth right costal cartilage, near the sternum. Pulmonary systolic murmurs have their point of greatest intensity at the base, close to the left edge of the sternum, and transmit toward the left clavicle. Venous murmurs, on the other hand, are quite frequent. In tricuspid regurgitation, with venous pulse, a systolic murmur may be heard at the origin of the descending vena cava in the neck. But much the most pronounced of the venous murmurs is the loud, continuous hum heard oftenest in anæmic young women, when the stethoscope is laid lightly on the jugulars just above the inner end of the clavicle. That it is in the veins is shown by its immediate arrest by pressing with the finger upon the vein above. In some anæmic patients systolic basic murmurs, transmitted into both the aorta and the pulmonary artery, are also sometimes heard. The various explanations of the genesis of these anæmic murmurs are too numerous to discuss, but their functional character is shown by their disappearance with the anæmia.

An examination of a case of heart disease cannot be considered complete without a careful comparison of its indications with the state of the arterial flow. The sphygmograph supplies a very satisfactory schematic representation of the relation of the action and states of the heart to the vibrations of the blood throughout the arteries, whether in health or disease, but its uses are not so much clinical as explanatory and confirmatory of the indications which manual examination of the pulse affords. The practising physician had much better rely on his sense of touch, which can be trained to note the conditions of the blood-current with a delicacy and certainty which no mechanical contrivance can match. But as in physical examination of the lungs palpation and percussion should precede auscultation, so a physical examination of the blood-vessel itself should precede that of the characters of its pulse-beat. To do this three fingers should be laid on the radial at the flexed wrist, and the vessel carefully palpated transversely and up and down its course. If the artery is in a normal condition, it cannot be felt as it lies in its sheath except by its beat. It may be felt instead as a smooth resistant cord or as a rough, hard, and crooked tube for some distance up the arm. In the first case, it may be only over full from obstruction to the outflow in the arterioles or capillaries. In the second case, it is not only over full, but its coats have become diseased and thickened with atheromatous patches, which in some patients give it the feeling of a string of beads. To determine whether it is simply a distended artery or a thickened one, the upper finger should then be pressed upon it, so as to stop the blood-current within, when, if it be only over full, the other two fingers no longer feel it as before, but if it is permanently thickened it is still perceptible as a hardened cord. The conclusions which this examination allows are not only of importance in cases of heart disease, but of many general conditions of the circulation as well, sufficient to affect the prognosis of a pneumonia or to suggest liability to hemiplegia. A diseased radial implies a general arterial degeneration, with extensive obliteration of arterioles. The skin in such a state of the circulation must be everywhere relatively anæmic, which it shows by its slowness to redden on friction; and, as the veins cannot receive the normal impulse of the heart through such an intermediate obstruction, the tendency to œdema on the supervention of an inflammatory congestion, as in pneumonia, is much increased. But it is on the work of the heart itself that the onus of the change is first and most felt, and besides this very probably in its nutrition, from disease of the coronary arteries on the one hand, and from extension of the same changes in the intima of the aorta to the semilunar valves.

The characters of the pulse may now be studied according to the six elements which enter into a pulse-beat. The first three depend

upon the action of the heart; viz. its frequency, force, and rhythm —that is, whether the pulse be slow or rapid, strong or weak, regular or irregular—while the other three depend upon the state of the vessel—namely (1) the size of the pulse, whether large or small; (2) its quality, whether it be compressible or incompressible; and (3) its length, whether the pulse-wave take a relatively long or very short time to pass under the finger. A seventh character of the pulse of a pathological kind may be added, the dicrotic, which in debilitated conditions, as in fever, is manifested by a reflux wave in the relaxed blood-vessel after the passage of the true pulse-wave.

The relation of the pulse to various valvular disorders has been already alluded to, but there is one pulse-character which merits a special mention on account of its bearing on the etiology of chronic heart disease; and that is the incompressible or high-tension pulse. It is very easily mistaken for a strong pulse, because the continued throb of the vessel after considerable pressure is exerted upon it gives the impression of a strength sufficient to force its way against obstructions, whereas, if the heart, the source of pulse-strength, be examined, it may be found quite weak. An incompressible pulse is solely due to obstruction in the outflow, just as one can stand on a hose if the stop-cock closes the water from escape. In an artery the outflow may be hindered by reflex nervous spasm of the arterioles, as in the hard pulse of peritonitis, or from irritant blood-ingredients, as in the hard pulse of gout, or from this with endocarditis added, as in chronic Bright's disease; and the general condition which leads to a continued high-tension pulse must necessarily, in time, lead to left-ventricle hypertrophy as the first in a long series of consecutive cardiac derangements. An incompressible pulse is also a long pulse, for the pulse-vibration is short only when there is no resistance to the flow. Besides the references to modifications of the pulse in valvular disease already made, we may say that in general the pulse in mitral regurgitation is irregular, both in force and frequency, and short. In mitral stenosis it is small, regular, and long until compensation begins to fail, when it may become irregular and less frequent than the heart-beats. In aortic stenosis the pulse is small, regular, and long. With the supervention of dilatation all rhythm may be lost and every variety of irregularity develop in force, frequency, and length.

Chronic Secondary Heart Disease.

The clinical history of many cases of chronic cardiac disease is that one who has never suffered from any form of heart affection before begins after he is forty-five years old to notice that he easily gets out of breath on going up stairs. In time this happens on comparatively slight muscular exertion, especially after eating. He concludes that

he is bilious, because dyspeptic symptoms, with some sallowness, make their appearance; but finally some swelling of the feet alarms him enough to consult a physician. On examination his radial artery can be felt and rolled like a cord in its bed, while his pulse is long and of high tension. Auscultation of his lungs gives jarring expiration, with mucous râles at both bases. The action of the heart is labored—that is, the systole is long with a muffled first sound, and the impulse strong and diffused—while the second sound at the base is clearer than natural at both edges of the sternum; but besides an occasional irregular or intermittent beat there is no murmur or other sign of heart disease. The urine is found to be abundant, pale, of low specific gravity, and occasionally with a little albumin and a few casts. Under proper treatment he gets better for a time, his breathing becomes easier, and all signs of œdema disappear. But after a while the same symptoms return, and he begins to have suffocative attacks at night, with more or less expectoration; his strength fails, his digestion is more impaired, albumin appears oftener in the urine, and the dropsy of the legs increases, till anasarca and pleuritic effusion progressively develop. Auscultation of the heart still fails to detect a murmur, but, instead, the rhythm of the heart becomes very irregular, and a discrepancy develops between the number of the beats of the heart and those of the pulse at the radial, the latter being much fewer. The dropsy continues to increase along with the embarrassment of the breathing, until death supervenes. The heart is found, post mortem, with the left ventricle greatly hypertrophied and the right less so, but often the valves seem to be all right. If the ventricle, however, be stretched by the fingers to reproduce its state in life, which has been lessened by post-mortem contraction, it becomes plain that it was then so dilated that both the mitral and the sigmoid valves must have been more or less incompetent. Some writers term a case like this "idiopathic enlargement of the heart." We might as well say that the patient spontaneously died. The findings after death show, instead, that for a long time the left ventricle had a hard task to perform, and which for an unknown period it did perform so well, because it grew for the purpose, that the patient was not aware that anything was wrong. It was not until it began to be labor-worn, and, losing its tone, began to dilate, that he noticed his breathing growing short. The real, primary cause of the heart affection, therefore, was the condition which gave such high tension to the pulse.

A ready explanation, which has been widely received, of the arterial tension which leads to cardiac enlargement, is that it is due to general endarteritis. When one considers the extent to which the lumen of the arteries must be diminished, especially in the smaller branches, by the sclerotic and atheromatous changes which are often

found so generally disseminated that immense numbers of the arterioles must virtually be closed by them, it seems as if the obstacle in the circulation to be overcome by the left ventricle must be equal to anything which a diseased valve could occasion, for no aortic stenosis could be more effective than such a general stenosis. But, unfortunately, some autopsies disprove the sufficiency of this hypothesis in both ways, for cases of general sclerotic and atheromatous arterial disease have been found without any cardiac enlargement accompanying them, and cardiac enlargements, on the other hand, have been as often found without any arterial changes. The cardiac enlargements, however, always had high-tension pulse in the clinical history, whether the arteries were diseased or not. On this account, Traube, who at first advocated the endarteritis theory, gave it up, and, instead of regarding the heart disease as caused by the arterial disease, regarded them together as due to a more general cause. Fränzel suggests that some unknown ptomaïne in the blood may be the primary cause of the high tension, and this, in turn, may be the occasion both of the endarteritis and of the heart disease. Without further discussing these theories, it is worthy of remark that in chlorosis we have a high-tension pulse, and, very often, cardiac hypertrophy, which disappears when the chlorosis is cured. Why cannot the circulatory difficulty in this case be in the capillary circulation, on account of the interference with the interchange between the capillary and the extra-capillary or interstitial circulation, due to the oxygen of the blood being altered? The extra-capillary circulation is, for nutrition, the most important department of the whole circulation; and that this may be itself the seat of the circulatory embarrassment on account of changes in the blood is rendered very probable by all that is known of the condition of the blood in cases of high-tension pulse, such as in gout, lead-poisoning, and renal disease. These are each conditions of blood-poisoning which can easily be conceived of as primarily deranging the osmotic function which capillaries subserve; which, it should be remembered, is not merely to conduct the blood, as the larger vessels do, but to exchange inflow for outflow with the interstitial current. This was the original hypothesis of Bright himself, to account for the frequent coincidence of heart disease with kidney disease, and I do not see that any subsequent theories have improved upon it. Muscular tissue is present in tubular structures only to move something out of them, and the increased tonus of the arterioles means that there is obstruction—not in them, but in the capillaries beyond; and a general blood-contamination disturbing capillary osmosis will therefore raise the whole arterial tension, with the effect of increased heart-labor, without arterial disease necessary anywhere. This blood-contamination, however, is very prone to set up inflammation in the intima, not only of the arteries, but, as has been shown by Arthur V.

Meigs, in the veins as well, so that, doubtless, arterio-sclerosis, while not sufficient to account for all cases of these forms of secondary heart disease, yet is a serious complication of the original cause of the cardiac affection.

High-tension pulse is found in every form of structural kidney disease, invariably in the contracted kidney, less invariably in the large white kidney, still less in waxy degeneration and in pyelo-nephritis; and consecutive heart-change is present in the same ratio in these different renal affections. But in addition to the arterial obstruction the toxæmia of Bright's disease is often a direct cause of endocarditis, sometimes of pericarditis as well, so that the usual ante-mortem symptoms and post-mortem findings of valvular disease, already described, are the rule in these cases. Besides developed kidney disease, persons with the uric-acid diathesis are prone to become short-breathed and to suffer general arterial change from an accumulation in the blood of imperfectly oxidized products of retrograde metamorphoses. Over-indulgence in eating, and still more in drinking fermented liquors, whether wines or beers, with sedentary habits favoring portal stasis, may develop all the train of the results of cardiac dilatation on the supervention of some extra-cardiac strain, as a bronchitis, or after some cause of general enfeeblement. With many others the tendency to heart disease, from the same circulatory conditions, is as plainly hereditary as a tendency to apoplexy. In Bright's disease the hypertrophied left ventricle often fails in power before the hypertrophied right ventricle does, with the result that the latter may overwhelm the lungs with more blood than the weakened left can dispose of. Attacks of a suffocative asthmatic kind, with profuse expectoration of blood-streaked mucus, may occur, or a more chronic condition of combined cardiac and respiratory dyspnœa from pulmonary œdema continue with great aggravation of the patient's distress. At other times Cheyne-Stokes' respiration may develop, when it is of worse prognosis than in most other conditions in which it is observed.

Heart Disease from Bodily Strain.

Badly-fed and under-nourished laborers, whose occupation entails carrying heavy loads up ascents, are prone to suffer from dilatation of the heart, coming on gradually without valvular disease, but ending in much the same way as the forms secondary to vascular disorder just described. To lift a heavy weight a deep inspiration is first taken, and then the expiration is suddenly stopped. The extensive muscular contraction which then follows while the breath is held forcibly empties the veins into the heart. It is easy to see that both ventricles must suffer distension from such an access of blood coinciding with an interruption of the respiratory rhythm, and, if the general muscular nutri-

tion is weakened by insufficient food and unhealthy drink, a constant repetition of such acts will naturally lead to dilatation of the heart. Occasionally cases occur in which acute distension of the left ventricle results from some one act of over-strain, as in a hospital patient of mine, a young, athletic ice-man, when attempting to throw a large block of ice along a sidewalk. He was seized with an intense pain in the cardiac region, which radiated down the left arm, and he fell breathless to the ground. On admission he was scarcely able to speak, he had a constant short cough, and was deeply cyanosed; the percussion dulness extended half an inch outside of the nipple line, and a diastolic murmur was present. In three days these physical signs had so diminished, and the patient felt so well, that he could not be persuaded to stay in the hospital, but left to resume his work. This was a dangerous proceeding for him, as the rule is that acute strain, unless time enough is allowed for recovery, sets up a chronic irritability of the heart which ends in incurable dilatation.

It is often asked of physicians whether athletic exercises, such as boat-races, football games, etc., so popular now with young collegians, do not entail risk of heart disease. There is no doubt that the severe preparatory training which many of them take would be dangerous to certain constitutions, for the profession has been made familiar with the results of such muscular strain by the treatises of DaCosta in this country and of English and German writers on the irritable heart of young soldiers, which is induced by prolonged drill and marching with too confining or heavy accoutrements. After a slight attack of diarrhœa or fever, the soldier on returning to duty soon finds that he suffers with palpitation or faintness, and he is returned to hospital with pronounced and obstinate disturbance of the heart's action, such as dyspnœa and rapid pulse, much increased by standing, and with failure of circulation in the extremities. If this state be not remedied by prolonged rest and proper treatment, what seemed at first to be but a functional derangement ends in permanent organic heart-damage, both valvular and muscular.

Muscular Degeneration of the Heart without Dilatation.

We prefer this term to "fatty" degeneration, because the group of symptoms which belong to the affection indicate a heart weakened by a muscular degeneration which may be fatty, and also may not be fatty, but something else. A patient just recovering from typhoid fever rises too quickly in bed, and thus induces fatal syncope. His heart is found, at autopsy, to be of a paler color than natural and of a soft and brittle texture, but the microscope shows nothing that resembles the real fatty degeneration of heart-muscle found in phosphorus-poisoning or in pernicious anæmia. So, in practice, we have patients

who show symptoms of essential cardiac debility—breathlessness on exertion, cold extremities, weak but compressible pulse, and with no visible or sensible apex-beat, while auscultation reveals no murmurs, but only a weak and short first sound, with much the character of the normal second sound. Chronic symptoms of heart failure, such as flatulence, diarrhœa, dropsy, and orthopnœa, may successively develop, and yet the patient recover and enjoy good health for several years, and then die suddenly, as a patient of mine did whose father and brother had died in the same way. Another patient had quite recovered for two years from similar symptoms, but succumbed in a week from acute dilatation of the heart brought on by a night's detention on the cars in New Mexico at an elevation of about seven thousand feet. The weakness in the heart-walls, which is the disease of these patients, has, however, different anatomical characters in different cases. In some there is a partial but marked fatty degeneration, associated with a diseased coronary artery. In others the fatty change is sufficient to be visible to the naked eye as fine yellow points or streaks crossed with darker striæ, especially in the papillary muscles. But it is after such acute affections as phosphorus-poisoning or so-called myocarditis in diphtheria, or in severe chronic anæmia, as pernicious anæmia, that such typical forms are found; instead, therefore, of being an independent disease in them, it is a sequel to other morbid processes. On the other hand, cardiac muscular weakness, proceeding to a fatal issue, sometimes sudden, occurs as a constitutional affection in persons frequently with a neurotic family history, in whom no more appreciable fibrillar change can be found in the flabby heart-muscle than in some cases of fatal angina pectoris. In the autopsies of corpulent persons who have died with symptoms of heart-failure deposits of fat are often found, under as well as over the pericardium, in such quantity as to suggest the hypothesis of invasion of the heart-muscle by fat as a distinct morbid state. This, however, is doubtful, as the heart disease is oftener explained by vascular and valvular disease being also present. There can be no doubt, however, that obesity, *per se*, is unfavorable to healthy cardiac tone by its interference with free respiration, and by its fostering the sedentary habits which weaken muscular structures in general.

Fibroid Degeneration.

This is a special morbid condition characterized by the presence of masses of hard white cicatricial tissue, found in the heart-walls, almost always of the left side. They can scarcely be said to be the results of endo- or pericarditis, for they may be imbedded in the muscular walls without either the endocardium or pericardium showing any connection with them. Sometimes they are so related to the endocardial surface as

to suggest their origin from a circumscribed abscess arising, as already explained, in an acute endocarditis; at other times they appear on the outer surface as white patches, to which the pericardium is adherent, or they appear as numerous streaks of connective tissue distributed irregularly through the muscular substance. That they do not constitute a true fibroid degeneration of the muscular tissue itself, however, is evident from the normal state of the fibres themselves; and it is now determined that they are caused by obliteration of atheromatous branches of the coronary arteries by thrombosis, and consequent degeneration of the parts supplied by them, with the usual substitution, in time, of cicatricial tissue. Syphilitic disease of the coronary arteries is also a frequent cause of the affection. The action of the heart may be much impeded by these tough structural changes in its walls, which occasionally produce such a local thinning of the ventricular parietes that pouch-like cavities, or so-called aneurisms of the heart, are formed.

As might be expected, auscultation can afford but little help in the diagnosis of this condition, as there are rarely any valvular signs. The symptoms are those of chronic circulatory embarrassment simply; the pulse is generally slow and intermittent, and the patient is very apt to sigh frequently. He is generally very despondent, from a sense of constant oppression in the chest, especially on exertion, and from general muscular debility. He may continue thus an invalid for years, and die finally with the usual developments of circulatory failure; or else he may expire very suddenly, as animals do in whom a large branch of one coronary artery has been tied, when for some time the beats seem to be but little affected by the operation, and then come to a sudden stop.

Extra-Pericardial Adhesions.

While the sequelæ of simple acute pericarditis, as previously stated, are not as serious as those of endocarditis, the same cannot be said if the inflammation involves the adjacent parts. If this occurs, the heart may become permanently fettered to the chest-walls, or to the mediastinal layers of the pleura, or to the diaphragm, or to the structures of the posterior mediastinum, with the most distressing after-effects, for the benign influence of hypertrophy, which counteracts obstructions for so long in other cardiac affections, is here, to a great extent, prevented by the irregularity of the heart-strains present and by their external seat. Primary dilatation of the cavities on both sides very commonly results, with cardiac pains and severe distress in breathing, general marasmus, and dropsy. When the adhesions with the pleura are extensive, we may have the *pulsus parodoxus*, so named because the heart-beats are affected by the movements of respiration. A left

pleurisy or pneumonia, simultaneous with a pericarditis, is therefore of evil augury, and no effort should be spared to check their mutual interaction.

Treatment of Chronic Heart Disease.

The treatment of chronic heart disease should be clearly separated into the measures which are palliative and those which are curative in their nature. We may fail equally with either, but that does not affect the difference in the objects sought for in the employment of the two classes respectively. Thus, under the class of palliatives come all the nervines which are prescribed in the treatment of organic diseases of the heart, such as digitalis, strophanthus, strychnine, caffeine, etc. Nervines never affect structures, but only functions. The organic changes remain just the same as ever, no matter how long the remedies are administered, and all that should be expected of a nervine is that it relieves some symptoms of the morbid condition, but not the condition itself. This is according to the therapeutic law, to which there are no exceptions, that any drug whose specific medicinal effects can be secured by one dose cannot modify or affect a structural change. We refer to these principles of therapeutics here because there seems to be such a widespread reliance on drugs in the treatment of organic lesions of the heart, any one of which might be taken as long as is that powerful cardiac nervine, tobacco, without the most skilful microscopist being able to detect its effect on the heart-structure. In many cases of cardiac dilatation digitalis affords as much relief as stramonium does in many cases of asthma, but the hundredth dose of stramonium does not do more than the first did; that is, relieve the symptom, bronchial spasm, for the disease, asthma, remains as settled as ever. Nor can any other nervine do more than digitalis does with each dose for a certain number of hours—viz. stimulate the contractile function of the heart-muscle, the heart-muscle reverting to its old state as soon as the functional effect of the symptom-medicine has passed off. Therapeutically, therefore, all such remedies can be regarded only as temporary makeshifts, with the chances that ere long they will begin to fail and become less and less effective. The beneficial effects of digitalis are due to the cramp-like contraction which it induces in the heart, as ergot does in the other hollow organ, the uterus. It therefore lessens dilatation by interfering with the over-relaxation of the diastolic period. For the time, therefore, the heart has returned to its natural cavity-dimensions, with great consequent relief to all the distressful accompaniments of a heart which does not empty itself with each stroke. It is therefore not as serviceable when the diseased heart does empty itself with each systole as in the first stages of aortic regurgitation, when it has not yet dilated beyond compensation. The

effect of digitalis on the pulse in a case of dilatation is often very striking, by its substituting slow regularity for the many ineffective contractions of the over-distended ventricle; and with such a recovery in the circulation we may expect the breathing to improve with the restoration of the cardio-respiratory rhythm, and with the chance thus given for the pulmonary œdema to be taken up. The hepatic stasis and the gastric congestion may be expected to improve next, and finally the kidneys will return to better work. The patient seems to improve in every respect, and hence this drug is often spoken of in terms which imply that it is *the* remedy for organic heart disease. Digitalis, however, should not be regarded as a routine stimulus for heart weakness, for in certain states of cardiac debility it frequently fails, and in others it is actually mischievous. There is no one fact better demonstrated by practical experience than that digitalis is powerless in proportion to the existence of fatty degeneration. The presence of a certain amount of normal muscular fibre seems necessary for its action. Hence we often note it at first beneficial in a case of dilatation, but then progressively to fail as the degenerative changes progress in the heart-walls. In diphtheria it should never be administered, for it immediately increases the irregularity of the pulse and will occasion the most urgent distress from its cramping instead of stimulating effect. It is also of very little use in the cardiac debility of fevers. Its use also should be intermitted or abandoned as soon as it disturbs the stomach. There is, moreover, one disadvantage in the action of digitalis, and that is, that it acts on the muscular coat of the arterioles as it does on the ventricle, and thus raises the tension of the pulse. In many cases, therefore, we lose as much by contracting the already too-much-narrowed arteries as we gain on the heart by contracting it. This is particularly exemplified by the aggravation which digitalis occasions in the cerebral symptoms of Bright's disease.

We have one nervine, however, which can both counteract this undesirable vascular effect of digitalis, and at the same time promote its action on the heart, illustrating the frequent advantage of combining nervines which act alike on some nervous functions, but differently on others. That agent is nitro-glycerin, which promptly dilates the arterioles, while it stimulates the cardiac systole and for several years I have been accustomed, on this account, to administer it simultaneously with digitalis, as well as with other so-called heart tonics, with a great improvement in the effects. Dr. Bradford, in his Bradshaw Lectures (1895), on the nitrites, brought forward the erythrol tetranitrate as more lasting in its effects as an arterial dilator than any other agent of this class. I can fully corroborate its superiority to nitroglycerin in all conditions where a prolonged action

upon the bloodvessels is desired. It is now imported, chiefly from Germany, in the form of tablets of 1 grain each. With some susceptible patients it is best to begin with half a tablet every three hours. On account of its explosiveness it should not be rubbed up with other powders.

The nitroglycerin should be administered only in a recently made solution, $\frac{1}{4}$ grain to 3 ounces of water, a teaspoonful of which contains $\frac{1}{96}$ of a grain. The small manufactured nitroglycerin pills supplied to druggists are often untrustworthy. The dose should be that which shortly after administration gives a slight sense of fulness in the temples. The difference in susceptibility among patients to this drug is remarkable, some being able to take $\frac{1}{25}$ grain without feeling it, while others complain of headache from $\frac{1}{100}$ grain. Beside this adjuvant, the action of digitalis is markedly promoted by mercurial laxatives. This is well illustrated in many cases of cardiac dropsy. Before the digitalis is administered 5 grains of calomel or of blue pill, with 40 grains of the compound jalap powder, may be given, and after this has operated $\frac{1}{2}$ ounce of the infusion of digitalis should be given every four hours for two days. The dose of the digitalis may then be reduced to 2 or to 1 drachm of the infusion, and with further mercurial purgation twice a week the digitalis may be kept up as long as no signs of stomach derangement occur.

Along with digitalis, strychnine or the tincture of nux vomica is another excellent adjuvant. I prefer the tincture, and give it in 10-drop doses with the digitalis and the nitro-glycerin. The administration of these three drugs can be kept up without change for an indefinite period with some patients, just as some asthmatics can take their favorite prescriptions for months, but with most patients digitalis after a time disturbs the stomach, and we are obliged to intermit its use.

The tincture of strophanthus, in doses of from 5 to 10 drops, is, according to my experience, a good substitute for digitalis, and I often prescribe it along with digitalis itself, as well as with the other nervines mentioned. It is particularly adapted to all cases of palpitation, whether functional as in Graves's disease or when complicating organic affections. It does not equal digitalis in the treatment of dilatation, for it does not interfere with the diastole, but it is almost free from the contracting effect of digitalis on the arterioles.

Caffeine and sparteine are both capable of increasing the power of the heart systole. Caffeine, however, is often prescribed in too large, and sparteine in too small, doses. A grain and a half of caffeine citrate is better than large quantities; for in some cases the too continued administration of 3 or 4 grains occasions cardiac arhythmia and distress, particularly in mitral stenosis. Caffeine when combined with

strychnine often acts as a free diuretic when neither of these drugs given separately will show this effect. The sparteine sulphate in doses of $\frac{3}{4}$ or 1 grain, along with caffeine and strychnine, often acts better in mitral stenosis or aortic incompetence than either digitalis or strophanthus.

In many cases of beginning arterio-sclerosis, with high-tension pulse, we have a serious symptom of developing mischief in a quickening of the pulse. These patients naturally complain of head-symptoms, and may come for the first time for advice on account of such troubles as vertigo, etc. The rapid pulse implies subacute endocarditis, and then aconite, with small doses of corrosive sublimate, $\frac{1}{30}$–$\frac{1}{24}$ of a grain, should be administered, with the constitutional treatment to be soon mentioned.

In contrast with this symptomatic treatment of chronic diseases of the heart the physician should study how their structural changes can be prevented or averted. This can be done only by reversing their processes of development according to the physiological laws which their development shows to have been contravened. Thus, the heart as a muscular organ depends for its vigor, as all muscles do, on the activity of the respiration. It is a universal law throughout the animal kingdom that muscular power is directly proportioned to the amount of oxygen consumed. This is why insects, who can breathe from nearly every part of their bodies, are so exceptional in muscular strength. The recent discovery that muscles have in addition to, and independent of, their contractile function, the function of generating animal heat is one of great significance in establishing the prime necessity of the oxygen-supply to them. The blood coming from a large muscle, such as the gluteus when at perfect rest, is nevertheless more venous in its diminished oxygen and increased carbonic acid than the blood of the right ventricle, because the latter contains visceral venous blood also, and glands, even when most active, do not abstract as much oxygen from the blood as muscles do when apparently most inactive. The application of these principles to a case of threatened weakening of the heart-walls is obvious. Such a patient demands the freest respiration which can be secured for him, and which will be in as complete contrast with his bodily habits in the past as possible. It is from that point of view alone that I regard Oertel's treatment of heart diseases as capable of doing good. The other features of the system, of enjoining active muscular exercise, such as mountain-climbing, etc., are applicable only to a minority of cases, and require the greatest discrimination in their employment, for the ratio between allowable work and overwork varies so much in different cases that I prefer safer methods for attaining the same results. A great deal of attention has been attracted, both in Europe and in this country, to the so-called Schott

treatment of chronic heart diseases as applied at the Nauheim baths in Germany. We have no space in this article to give its details, but the effects are attributed to the impression over the whole surface of the body caused by the strongly saline waters of the baths combined with an excess of carbonic acid, to which are added passive and resistant exercises of the muscles. In this country a number of imitations of the salts are put up, along with cakes of tartaric acid, to make artificial Nauheim baths, particularly by the Triton Co., of New York, and I have had frequent recourse to their employment. Within limits I can fully endorse the beneficial effects of these baths. The peripheral circulation seems to be much improved by them and the labor of the heart thereby lessened. But in every case the effects have to be carefully watched and graduated according to each patient's response to the bath and to the exercises. Two patients with apparently just the same cardiac conditions will prove on trial to be very differently affected. In general, however, no one with extensive rigidity of the arteries should be allowed to enter upon the treatment.

An ideal environment for a patient with organic heart disease would be a comfortably furnished shed-shaped tent, with good ventilators at each end and with a board floor well raised from the ground. Tents with all the requisite facilities for camping can be obtained in this country now, and with a little experience a camp-life can be made more comfortable, enjoyable, and less expensive than living at any Adirondack hotel, with the great object secured of really constant free breathing; for no dwelling apartment can give the same air at night which the patient receives through the tent-walls, as it is continuously changed through them without a draught. The most noticeable effect of two or three months of camp-life is in the lowered arterial tension, which may be noted even in the worst cases of arterio-sclerosis. The restoration of visceral muscular power is also illustrated in many other ways. I have known obstinate constipation of years' standing thus spontaneously relieved, the residual urine in elderly patients with distended bladders greatly reduced (in one case a man of seventy-four was quite cured), and chronic bronchitis progressively improve, with no other agency to account for these results than simple free breathing, with but very moderate muscular exercise. When camping cannot be resorted to, the next most continuous mode of open-air life must be devised, and the patient be enjoined to spend as little time indoors as possible, the details for securing this end being those which circumstances will permit.

It is on this principle that iron is the medicine for organic heart disease, not only as a standard remedy, but as a prophylactic against muscular degeneration. Iron has only one object in the animal econ-

omy. Without it we could not breathe. To keep up the due proportion of this oxygen-carrier in the blood is therefore the great indication whenever a form of muscular weakness is likely to develop, whether in the bronchial tubes, the alimentary canal, the pelvic organs, or, lastly, in the circulatory system. Every case of organic heart disease or vascular disease therefore indicates the use of iron, if only to keep hypertrophied muscles from losing their contractile power. The prompt improvement caused by iron in such a variety of disorders of weakened tubular organs is not because it cures "anæmia," but because it revivifies their muscular walls with an increased supply of oxygen.

In primary chronic valvular disease open-air life and iron, taken from time to time as a prophylactic, will serve indefinitely to ward off the day of heart failure. With the rheumatic cases, however, we must be on the constant watch for relapses of the rheumatism, and consequent further heart mischief. As the left ventricle often hypertrophies rapidly in young persons with aortic lesions, while the right does not, pains in the cardiac region and palpitation are prone to develop from derangement of rhythm between the two sides. For this belladonna is the best sedative, in 10-drop doses of the tincture, with 4 or 5 grains of potassium iodide three times a day, and the patient should wear a belladonna plaster. Cod-liver oil is of great service in many cases also. Its first use in medicine, to which it was restricted for over a century, was in the treatment of rheumatism, and for the anæmia of protracted cases of the subacute articular form it is superior to any other remedy. During cool or winter weather these patients should wear as a preventive buckskin shirts over light flannel underwear, and they should sleep in flannel. It is always risky for rheumatics to indulge in cold-water bathing, but the ancient practice of daily skin inunctions is one of the best of prescriptions for them against fresh attacks.

In chronic secondary valvular disease we have to take into account the constitutional state which has caused the heart affection. Where there is a condition of general arteriosclerosis, also in gouty or lithæmic cases, with a high-tension pulse, the sodium iodide in 5-grain doses three times a day may be given with benefit for weeks together. It is in these cases also that the administration of salines and of saline waters is often of great service. Many patients are benefited by taking lithia waters instead of ordinary water for their daily drink. In gouty states the French Contrexéville Pavilion Spring water has obtained a deserved reputation. It is chiefly in this class of patients also that the administration of small doses of arsenic is serviceable. Dr. Balfour recommends a mixture of equal parts of liq. arsenici hydrochlorici and of liq. strychninæ hydrochlorici, dose 3 to 6 drops, to be given as long as the digestion is not disturbed.

The heart complications of Bright's disease have to be treated in connection with the kidney affection. Where the urine is pale and of low specific gravity, with a moderate deposit of albumin, corrosive sublimate, taken for a week at a time, $\frac{1}{24}$ of a grain three times daily, and then omitted for a week, has, in my experience, repeatedly improved the color and specific gravity of the urine, and has lowered the arterial tension. The important adjuvant action of nitro-glycerin has been already alluded to. It is in these patients also that the beneficial effects of frequent warm, but not hot, baths in relaxing arterial tension is manifested.

In the renal cases, of whatever form, the importance of regulating the diet cannot be over-estimated. In view of the recent advance in our knowledge of the relations of intestinal digestion, and the rôle which auto-infection from intestinal poisons plays in the genesis of vascular and kidney disorders, the indications for supplying the most easily assimilable food, with the least excess possible of too concentrated nitrogenous ingredients, in kidney disorders, are more than ever confirmed.

No case of high-tension pulse, with consecutive heart complication, should take a hearty meat diet. The best food for such patients is the fermented milk of the Arabs. All pastoral peoples, who have to live exclusively on milk, as most Bedouins and Tartars do, have found that the stomach must be spared the curdling of the milk, else enough gastric juice is not left to complete the digestion of the precipitated casein; which, moreover, if precipitated in the stomach, is apt to be in too large and solid curds. They therefore artificially ferment the milk with the yeast-plant. The Arab method is preferable for invalids to the kumyss of the Tartars, as this is apt to be too acid from keeping. The "leben" of the Arabs or "matzoon" of the Turks is made daily by adding some of the fermented milk of the previous day to the fresh milk as soon as it is brought in from the milking. The "leben" the next morning is a slightly acid fluid of the consistence of cream, with small flaky curds and with the taste of buttermilk. I regard it as the completest and most digestible food for invalids that can be furnished, and the most striking illustration of its adaptability is to be found in severe organic diseases of the stomach with intractable vomiting, as in gastric ulcers or cancer of the stomach. In Bright's disease it has seemed to me often curative, and at least as near the typical food for giving the diseased kidneys the minimum of work as can be devised. The more the patients take of it to the exclusion of other food, the better, and to accustom them to its use they may begin with a half pint taken as a first course with each meal. It should always be *eaten* with a spoon like soup, and not drank. After a time larger and larger quantities will be readily dis-

posed of. The directions for making it are: to break up by thorough stirring half an ordinary yeast-cake in half a pint of good fresh milk which has been warmed to a blood heat. This should then be kept for eight to ten hours in the kitchen, with occasional stirring, at the end of which time the milk will be found to have soured. Six tablespoonfuls, or 3 ounces, of this soured milk should then be stirred into a half pint of fresh milk, and the first half pint with the yeast thrown away. The second specimen will ferment in the same time as the first one did, but cannot yet be eaten on account of the still perceptible bitter taste of yeast; but 3 ounces of it can be used for a third specimen. In the fourth specimen the taste of yeast is no longer perceptible, and then the leben can always be made for each day's use in the proportion of 6 ounces of the leben of the previous day to a pint of new milk. It is better to stir it well as soon as the milk is found to be changed, and then put in a refrigerator to prevent further acidification. Sometimes, after a month or two months, the yeast ferment seems to die out, and the process has to be begun again as above detailed. If it seems to make too large curds, it need then only be stirred well before eating it. The richer the milk in cream, the better and smoother the leben. With this milk and a digestible vegetable diet (excluding beans, asparagus, and fibrous vegetables, as turnips, beets, etc.), and a good supply of ripe fruit, especially grapes, the tension of the pulse may be found soon much less than when meat and fermented liquors have been largely used.

The management of certain acute complications remains now to be briefly spoken of. In all cases of labored heart-action a daily evacuation of the bowels is very necessary, for constipation quickly raises the tension of the abdominal arteries, and thus increases the heart's work. One teaspoonful of Epsom salt or two teaspoonsful of phosphate of sodium with a grain of quinine, in a tumbler of hot water on rising, may be prescribed as in most cases a sufficient laxative. In others a teaspoonful of the compound liquorice powder, with a teaspoonful of cream of tartar at night, while in still others one-fourth or half a tumbler of Hunyadi water in the same amount of boiling water in the morning, is best. All highly carbonated waters are ill borne by patients with heart disease, and the hot water is a good addition to prevent or to get rid of the flatus which remains after most mineral-water purgatives have acted.

In advanced cases of heart disease we are often obliged to have recourse to opium to secure sleep. The rhythm of lung- and heart-action needed for sleep will not come without it. It is a hard alternative to meet, for the ultimate effect of the drug is undesirable, and its administration should be postponed until it is plain that the patient will be more weakened by his sleeplessness without it than by his

depression with it. Any other soporific is useless, particularly chloral, but the aromatic spirit of ammonia may be very advantageously added to morphine when the alkaloid is given.

The attacks of asthmatic suffocative congestion of the lungs in renal disease with cardiac dilatation require prompt and active treatment. The aim should be to rouse the weakened left ventricle to action, and for this purpose a hypodermic injection of $\frac{1}{8}$ grain of morphine with $\frac{1}{120}$ grain of atropine should be given, and simultaneously by the mouth a tea-spoonful of aromatic spirit of ammonia with 3 tea-spoonfuls of the elixir of valerianate of ammonia in water. Dry cupping over the kidneys and back of the lungs should then follow, with the application of a large blister to the front of the chest, which should be allowed to stay on long enough to redden the skin, but not to produce vesication. As soon as the dyspnœa and the expectoration show symptoms of subsiding, a brisk cathartic of 40 to 60 grains of compound jalap-powder, with 5 grains of calomel, should be given, or 1 to 2 drops of croton oil. Fränzel recommends 1 grain of acetate of lead to be given every hour while the urgent symptoms continue.

In the ascites of dilated heart from extra-pericardial adhesions I have seen more good follow tapping than in abdominal dropsy from any other cause. The severe distress of the patient is often remarkably relieved, for it would seem as if abdominal distension produced a special strain in these patients on the adhesions to the ribs and to the lower sternum. One measure, however, should never be neglected in these patients, and that is to strap firmly the ribs of the left side with adhesive plaster up to the axillary line. The strips should extend from the spine to the median line, following the direction of the ribs, and in applying them pressure should be made along the lower, and not the upper, border of the strip, to have it fit evenly, each succeeding strip also overlapping half the width of the one previously applied. The great relief which this uniform restriction of the movements of respiration over the heart affords is immediately appreciated by the sufferer. From time to time the strips have to be left off on account of irritation of the skin caused by the plaster, and during the interval the whole præcordium should be rubbed with an ointment composed of unguentum stramonii, unguentum hydrargyri, of each ʒij, oleum cinnamomi gtt. ij, in hopes of assisting in the absorption of the adhesions.

DISEASES OF THE BLOOD-VESSELS.

By FREDERICK C. SHATTUCK, M. D.

Diseases of the Arteries.

Acute inflammation of the inner and middle coats of the arteries is relatively rare, and more apt to result from the irritation of an embolus than from any other cause. It is manifest that treatment is possible only when a peripheral vessel is affected, and it is then comprised in rest—local, general, or both—soothing applications, and morphine or other anodyne if pain demands their use. Should aneurism develop, surgical measures alone are in order.

Periarteritis, the result of injury or of the extension of inflammation from surrounding parts, also comes within the province of the surgeon rather than of the physician: if an accessible abscess forms, it should of course be opened.

Chronic inflammation (atheroma, arterio-sclerosis, endarteritis deformans), so often combined with degenerative processes, does not present a very fruitful therapeutic field. Could we prevent syphilis and the abuse of alcohol, could we ensure everybody against excessive bodily and mental strain, we should go far to obviate the necessity for trying to treat these arterial changes and their allies, concomitants, and results; at least until a late period of life. Plumbism is, according to English writers, a preventable cause which is worthy of mention.

It is not often that the physician has the opportunity in connection with this disease to exercise his highest function—prevention. Changes are usually more or less advanced when their subjects come under observation. As is indicated above, the chief means of prevention consist of a strictly hygienic manner of life. There is reason to believe that arterio-sclerosis may be a matter of inheritance, but that the tendency can be effectually combated or delayed by temperance and moderation in all things—food and drink, work and play—and by the cultivation of an equable temper. It is highly probable that the wear and tear of modern life, the fierce struggle for wealth and position, prove as disastrous to the integrity of the arterial walls as does a life of ease with its temptations to over-indulgence of the appetites and to sloth of mind and body. It is to be hoped that this latter tendency may be counteracted by the favor now shown to athletics, and

by the habits of self-denial which their pursuit entails to a greater or less degree on all their votaries. At the same time, we recognize the dangers of indiscriminate and undue indulgence here as well as elsewhere.

Endarteritis may be more or less general, or it may be local. The local form, as seen especially in the brain, heart, and kidneys, does not lie within the scope of the present article. The treatment of the general variety should be causal as far as is possible—not far usually, it must frankly be stated. The arteries which are the favorite seat of syphilitic changes are those of the brain. It is, moreover, impossible to be sure whether a syphilitic arteritis has gone beyond the point up to which retrogression may take place under the use of potassium iodide and mercury. The patient should therefore be given the benefit of the doubt and full antisyphilitic treatment.

Apart from those cases in which the changes can be reasonably laid at the door of syphilis, the treatment of arterio-sclerosis varies with the presence or absence of compensatory cardiac hypertrophy. If this be present, it should be our aim to maintain it by careful regulation of the diet and exercise. The nutrition of the heart-muscle depends primarily on the free circulation through it of healthy blood in sufficient amount, while the main source of the blood is, of course, the food. This should be simple, nutritious, easily digested, and given in such amount and at such intervals as the individual case seems to require. A constant supply of pure air and sufficient sleep are of the greatest importance. Careful and specific directions should also be given as to the amount and character of exercise, bathing, and clothing, it being remembered that the kidneys are seldom perfectly sound in these cases. It is almost impossible here to do more than indicate general principles. Success depends on the thoroughness of the physician and on his skill in individualizing his patients and inducing them to carry out his injunctions, however unwilling they may be to do so. But it is not enough to see that the conditions for the formation of healthy blood are met: its purification must also be ensured. The measures of general hygiene above alluded to minister to this end, but they must be supplemented by careful attention to the bowels and kidneys. The retention of excrementitious products is believed to be a potent cause of increase in the arterial tension, a continuance of which favors changes in the vascular walls, and also makes greater demands upon the left ventricle—demands which in time can no longer be met, and which hasten the predominance of dilatation over hypertrophy. In fat and plethoric persons limitation in the fluid ingested, further reduction in the blood-mass by watery catharsis at stated intervals, and graduated exercise should be cautiously combined with suitable diet. The essence of the various and apparently conflicting systems for the reduction of

corpulence is simply an avoidance of excess. But all efforts in this direction should be well considered and tentative, and the reduction must, above all, be very gradual.

In cases of general atheroma we are between two fires. If the heart is weak, nutrition suffers; if it is strong, there is danger of the rupture of a cerebral artery or miliary aneurism. Hence the obvious necessity of avoiding over-, and especially sudden, exertion. There are, in many cases, no certain means of arriving at accurate knowledge of the condition of the cerebral vessels. If the radials and temporals are diseased, so are presumably also the vessels of the brain. But the latter may be the seat of advanced changes, although the former appear healthy. We must therefore often take the chances and follow general principles. It is, moreover, notorious that individuals whose peripheral arteries are calcareous to the last degree not infrequently enjoy a life of surprising length and comfort.

The drug-treatment is always of secondary importance, except where the vascular change is of syphilomatous nature. Here potassium iodide should be given in initial doses of 10 or 15 grains thrice daily, and it is probable that the simultaneous administration of mercury tends to render the effects of the potassium salt more permanent. If the symptoms are urgent or do not promptly show signs of yielding, the iodide should be increased steadily and more or less rapidly until either the desired effect is produced or the drug disagrees. Improvement or iodism are the indications for dosage, not the number of grains. A convenient manner of administering the drug is in concentrated aqueous solution, 1 minim of which represents about 1 grain. Free dilution is important, and milk will often be found a good vehicle. In some cases large doses are well borne although small ones provoke discomfort. It is not, perhaps, a matter of great importance what mercurial is used, unless it is desirable to bring the system rapidly under the influence of the remedy; in that case inunction is generally admitted to be the best. But inunction is a dirty, time-consuming, and tell-tale method, to which others are in ordinary cases to be preferred. The protiodide in $\frac{1}{6}$-grain pills is a convenient form, but should never be given at the same time as the potassium iodide, lest the more poisonous biniodide of mercury be formed. By giving the potassium iodide fifteen minutes before meals and the mercury after meals, all danger is avoided. The number of pills can sometimes be gradually increased with advantage up to six or nine a day, the usual precautions being taken against salivation.

We are acquainted with no drug which can very materially influence endarteritis of other than specific origin. The treatment must here be emphatically of the patient, rather than of the disease. Potassium iodide is often given, more commonly in doses of under

rather than over 10 grains, three times a day. Bartholow and some others claim that salts of gold have the power to prevent the formation or to cause the absorption of connective-tissue growth, and are hence indicated in arterio-sclerosis. The remedy is generally given in the form of the double chloride of gold and sodium, $\frac{1}{20}$ to $\frac{1}{10}$ grain after meals.

In cases of persistently high arterial tension the labor of the heart can be lightened by the use of the nitrites. Of these the most convenient and stable is nitro-glycerin, the ordinary dose of which is 1 minim of the 1 per cent. alcoholic solution. This is now to be had in tablet triturates, for elegance and convenience leaving nothing to be desired. One of these can be given from two to six times a day, according to circumstances, among which is to be reckoned individual toleration. In some persons the dose must be smaller, but it should never be pushed to the point of headache and flushing of the face, except for the purpose of determining the limit of toleration. The relaxant effects of the nitrites on unstriped muscular fibre are certainly remarkable. Diuretics, diaphoretics, and purgatives may be so used as to do good service in cases of high tension.

If the compensatory hypertrophy of the heart is failing or has failed, the indications for treatment become quite different. The leading one of these is the restoration of sufficient vigor to the heart-wall, if this be possible. Rest is here imperative, except in cases of obesity with presumable large accumulation of fat in the subpericardial tissue. In such cases the treatment known by the name of Oertel may be applicable, but only under the careful supervision of an intelligent and cautious physician. In combination with rest, a nutritious diet with frequent small meals, an abundant supply of fresh air of moderate temperature, with proper precautions against chill—a weak heart presupposes a poor circulation—and freedom from excitement and worry are of the greatest importance. Alcohol is here indicated, especially if the appetite and digestive power are impaired. As to the form, no absolute rule can be laid down, but in the majority of cases whiskey and water is the best. It may be necessary to stimulate the appetite also by one of the vegetable bitters before meals, of which nux vomica or strychnine is the best. The value of strychnine is not only in its stimulating action on the gastric mucous membrane, but also in its tonic effect on the heart, and probably the vessels. If there is any tendency to angina, this drug, if used at all, should be given with great caution and only in small doses.

The natural digestants, pepsin and hydrochloric acid, are usually not necessary, the feeble digestion being largely dependent on sluggish circulation and consequent defective secretion, and thus tending to mend with an increase in heart-power. This is to be striven for

with the aid of digitalis or one of its allies. If it be true that digitalis increases arterial tension, while strophanthus does not, this is a class of cases in which the latter is to be preferred. But it is probable that this difference in action is, in the present state of our knowledge, somewhat theoretical; and most of us in practice turn first to digitalis: if this disagrees or fails, the other members of the group—strophanthus, convallaria, sparteine, adonidine, caffeine, helleboreine, etc.—may be used in turn. Special care should be taken to guard against overdosage with any of these remedies, omitting them, at least temporarily, when the quantity of urine reaches or nearly approaches the normal. If it is desirable to continue digitalis for some time, the valuable suggestion of Balfour may be followed—to give it, namely, only twice a day, the doses being separated by an interval of twelve hours. Danger of cumulative action is thus largely obviated, and the drug may be taken steadily for long periods with great benefit in some cases. The effect of the diffusible cardiac stimulants is only transitory, but aromatic spirit of ammonia, compound spirit of ether camphor, musk, and the like may be so used as to render valuable service.

Sleep is of the utmost importance, and must be secured by artificial means if it does not come naturally. Morphine is often the best hypnotic in these cases, quite apart from asthmatic and anginose attacks, in which it is nearly indispensable. Of the less powerful hypnotics, those which, like chloral and the modern antipyretics, tend to depress the heart, are to be shunned.

Degeneration of the arterial walls occurs in three forms—fatty, amyloid, and hyaline. Of these the most common is the former, but it is almost always so closely associated with changes which are classed by pathologists as chronic inflammatory that it has been already considered in the previous pages. It only remains to add here a word as to the tendency of anæmia, resulting in deficient oxidation, to provoke fatty degeneration. The therapeutic bearing of this fact is sufficiently obvious.

Amyloid change in the vessels may be inferred if its presence can be recognized clinically in the liver, spleen, or kidneys, and not otherwise. The treatment, of course, is that of the chronic syphilis or suppuration to which the change is secondary. Hyaline degeneration cannot be recognized during life, and consequently requires no further mention here.

Arterial thrombosis is the result of a feeble blood-current and of roughness of the inner coat of the vessel, or else it forms behind an embolus partially or totally occluding the lumen. This statement indicates the line which prevention should follow as far as is possible. After occlusion has taken place our efforts must be confined to such

measures as favor the establishment of collateral circulation. If a cerebral or visceral vessel is thus affected, all we can do is to enforce rest and strengthen a weak heart-beat: the necrosis of gangrene which may follow the plugging of an important artery of an extremity may render amputation necessary. An underlying diabetes must not, of course, be overlooked.

Embolism of an internal artery offers, perhaps, even less opportunity for treatment than does thrombosis, in that the heart is less likely to need stimulation. Potassium iodide is often given, but there is no evidence that it is of real service unless syphilitic arteritis is present: even then the drug cannot, in all probability, promote the absorption of an embolic or thrombotic plug or restore life to necrotic tissue, though it may do much to prevent recurrence of occlusion. Prevention of the formation of endocarditic vegetations is but little within, that of their detachment is quite beyond, our power at present. Embolism of a main branch of the pulmonary artery is immediately or rapidly fatal: if a medium-sized branch is affected, the heart is likely to demand prompt stimulation, but thrombosis often works backward toward the right ventricle. Infarction of a lobular branch is often latent and requires no treatment, even if diagnosed, unless it is followed by pleuritic pain. In splenic and renal embolism also pain is the sole indication for treatment. Embolism of a large branch of a mesenteric artery may occasionally be recognized during life, but we can do little or nothing for it beyond keeping the patient alive as long as possible. Emboli from a foul source are liable to be followed by suppuration, and the resulting abscess, if accessible, is to be opened as early as may be. The writer has seen such abscesses, seated in the skin and derived from malignant endocarditis—which, in its turn, was secondary to dysentery—spread for a time and then heal perfectly, though the patient finally died. The treatment of cerebral embolism will be found in another part of this system.[1]

Fat embolism of the lungs, generally the sequel of trauma with laceration of fat tissue, is not amenable to direct treatment.

Dilatation of Arteries—Aneurism.

Under this head it is proposed to consider aortic dilatation and aneurism alone, these conditions of peripheral vessels belong eminently to the surgeon.

The indications for the treatment of aortic aneurism are simple enough. Obliteration or contraction of the sac is the end desired, and the chief medical means of its accomplishment is reduction in the force and frequency of the heart-beat, with an increase, if possible—but at least no diminution—in the coagulability of the blood.

[1] See article on Apoplexy, etc., page 687.

The difficulty lies in meeting these indications, and is twofold. Our means are so very seldom productive of anything more than palliation, and most of them are so severe, that a physician thus affected would generally prefer a shorter life—if, indeed, that is to be called life which consists in absolute disability for a prolonged period without any reasonable prospect of radical benefit—to subjecting himself thereto. Drs. Murchison and Hilton Fagge worked to the last. But most of our patients are not physicians and, perhaps happily for them, cannot take a physician's point of view. There is no question, moreover, that life can be prolonged and suffering alleviated in most cases, while here and there in medical literature reported cases of cure are to be found. At all events, it is certainly our duty to do all that we can in every case.

The leading principle of management, the diminution of intra-vascular pressure, has been recognized since the days of Hippocrates, and was carried to its logical extreme by Valsalva, though his repeated bleedings have fallen into disuse, because we believe that they tend to defeat their own object, in that under them the irritability and frequency of the heart are increased. Restriction in diet also, if carried too far, lessens the coagulability of the blood. The purely medical treatment of the present day, therefore, is mainly that of Tufnell, though the limitation of the ingesta is not usually carried to the full extent recommended by him. His dietary is—2 ounces of bread and butter and 2 ounces of milk for breakfast; 2 or 3 ounces of bread and 2 or 3 ounces of meat for dinner, with 2 to 4 ounces of milk or claret; 2 ounces of bread and 2 ounces of milk for supper. The researches of A. E. Taylor[1] seem to show that water should be freely given if we desire to saturate the tissues with calcium salts in the hope of favoring coagulation in the sac. Contrary to the assertions of various French writers, Taylor could not discover any acceleration of the rate of coagulation after the injection of calcium chloride per os. With this is to be combined the maximum degree of bodily and mental rest, sudden exertion or emotion being especially shunned. Straining at stool is to be guarded against; coitus is to be forbidden. This treatment makes such demands on the self-control and fortitude of a patient that it can be very seldom carried out for a sufficiently long period to yield its best results, especially as we cannot hold out much hope of a real cure. And it may be added here that the nature of his trouble and the rationale of the treatment should be set forth to the patient with a fulness which must depend on his character and his circumstances as influencing the rigidity of the course to be pursued. In actual practice a larger liberty is, and must usually be, allowed than is above set down. We must do the best we can with each patient, keeping constantly in view the main principle of avoiding unnecessary, and above

[1] *Jour. Exper. Med.*, May, 1898.

all, sudden, exertion. This principle is not invalidated by the very rare cases in which the subjects of aortic aneurism have led active, perhaps laborious, lives for periods that one would have said to be impossible.

The drug-treatment is limited to opium or other anodynes for pain, and sedatives or hypnotics as adjuvants or promoters of rest; the only direct remedy which can claim any really trustworthy evidence of success is potassium iodide. The constipating tendency of opium and its derivatives must be guarded against; but the danger of acquiring the opium habit need not weigh heavily on our minds here if pain can be alleviated or wearing discomfort markedly lessened. If the same end can be attained by chloral, phenacetin, or its congeners, etc., so much the better. Balfour is a very prominent, though he was not the earliest, advocate of the employment of potassium iodide, the good effect of which seems to be more clear than does its mode of action. Balfour thinks that this is "mainly by some peculiar action on the fibrous tissue, whereby the walls of the sac are thickened and contracted, while if coagulation should take place within the sac, it plays but a very secondary and unimportant part and depends for its occurrence solely on the condition of the blood, and is in no respect due to the iodide of potassium." Bramwell doubts the occurrence of this hypertrophy. Both lay stress on the influence of the drug in reducing the blood-pressure and relieving the tension within the sac. Balfour does not now advocate such large doses as he did at first. The blood-pressure is to be lowered without increasing the frequency of the pulse. A case coming under treatment is therefore to be put to bed for a few days without medication until the normal pulse-rate of that individual while at rest can be determined. Ten grains of the iodide are then to be given thrice daily, and the dose is to be gradually increased, provided that the pulse-rate does not rise: Balfour finds that 15 grains is the maximum, 10 often the better, dose. It should be continued for months. He believes that, even without rest, the drug can render great service. No other remedy is used so much in the treatment of aortic aneurism at the present day, and it is generally given in larger doses than seems to Balfour desirable in the light of his later experience.

The application of an ice-bag over the tumor often allays pain, and may possibly promote coagulation. We are cautioned to be very careful in its use if the walls are thin or the skin discolored, lest rupture be hastened through impaired nutrition of the cutaneous layer. Ice over the heart itself tends to moderate its action, and may thus be distinctly serviceable. A small venesection is said sometimes to relieve pain markedly, and should be tried if milder means fail. The chloride of barium may be given in pills of $\frac{1}{10}$ grain each three times a day

after meals, with advantage in some cases. A patient of the writer with aortic disease has found the greatest relief from attacks of severe angina from the barium salt, which he has taken uninterruptedly now for twelve months. He is a person of unusual intelligence, and says that "the pain is there, but is kept in control." To cut short an anginose attack nitro-glycerin is the best remedy.

Pressure, the aim of which is to slow or obstruct the blood-current, and thus bring about coagulation within and obliteration of the sac, in its several means of application so useful in aneurism of peripheral arteries, can obviously render little, if any, service in thoracic aneurism. The writer recalls a case in the Boston City Hospital some years ago in which sheet lead was accurately moulded to the surface of the tumor, the number of sheets being gradually increased. Some diminution in the swelling took place, but absolute rest was simultaneously enforced. Sand- and salt-bags have also been used. Abdominal aneurism has been successfully treated by compression with a tourniquet under an anæsthetic by Murray of Newcastle and others. Woirhage[1] has collected 9 cases thus treated, with 6 good and 3 fatal results. Unfortunately, the most frequent seat of abdominal aneurism is just below the diaphragm, a point at which pressure cannot be applied. Before putting on the tourniquet the bowels should be freed, as far as is possible, from both liquid and gaseous contents; and Murray advises that complete arrest of the circulation through the sac should be aimed at for four hours. If on removing the tourniquet no impression has been produced on the pulsation, the first attempt must be considered at an end; but if the pulsation is somewhat diminished, the instrument should be reapplied for another hour. If the first attempt is unsuccessful after an interval of a few days, pressure should be maintained for six to eight hours; finally, even to twelve. The fatal results have been due to injury to the abdominal viscera, especially the intestines—ecchymosis, rupture, and peritonitis.

Langenbeck reported favorable results from the hypodermic injection of *ergotin* over, or in the neighborhood of, the sac: the method has fallen, doubtless justly, into disuse.

Acupuncture was first practised by Sir E. Home, and of late years by Constantin Paul;[2] it is now used in combination with the galvanic current.

Electrolysis.—The power of the electric current to coagulate albumin not unnaturally suggested its use in the efforts which have been made for years to cure, or at least ameliorate, a malady so intractable as aortic aneurism. It is said to have been tried first by Phillips in

[1] Thesis, *Jahresbericht*, 1876.

[2] *Bull. de l'Acad. de Méd.*, 1888, xx. p. 224.

England, soon after by Petrequin of Lyons. Both needles have been introduced into the sac, or one alone. That which is connected with the positive pole produces a much firmer clot than that from the negative, and is consequently to be preferred, while the large copper electrode attached to the negative pole is placed at a convenient spot on the surface of the body. The needle should be insulated in such a way that the integument and the true wall of the sac are protected against the caustic effect of the current. The recommendations as to the strength of current and also the duration of its passage are vague or vary within pretty wide limits. In but very few of the cases does a galvanometer seem to have been used, so that accuracy is not easy of attainment. DeWatteville[1] says the intensity should not exceed 20 to 30 milliampères, nor the duration of the first sitting surpass half an hour. Dujardin-Beaumetz,[2] no longer, according to Potain, as warm an advocate of the method as he was, advised an intensity of current reaching 54 on the Gaiffe galvanometer, and ten minutes as the maximum length of sitting, lest the needle be oxidized and possibly broken on withdrawal. Petit[3] has collected 114 cases of thoracic aneurism treated by electrolysis, with relief in 68. He thinks that his analysis shows a greater probability of relief when the procedure is resorted to before the development of an external tumor. We will not occupy space with a table showing the duration of the improvement attributed to the treatment. That the results are really not encouraging seems to be pretty clearly shown by the fact that comparatively few cases have been reported during the past ten years, by the tone of the discussion at the Medical Society of London,[4] and by the article of Potain.[5]

Still, it is fair to state that there are cases of which two of Richter's[6] may be taken as samples: An engineer of a water company, whose calling involved such severe muscular work as climbing cañons, was treated by electrolysis for a thoracic aneurism in 1884. Four and a half years later, though he still followed his occupation, the original aneurism was well, but a second had developed somewhat higher up. This was treated in the same way, and the patient returned to work. An innominate aneurism in another patient was similarly treated, and also, it is stated, with success; but death followed six and a half months later from tracheal pressure, causing suffocation. Richter thinks that the fatal result was due to a new aneurism, not to extension of the old. It has been remarked that aneurism seems to be common in California.

In comparison with these cases may be cited those mentioned by

[1] *Medical Electricity*, N. Y., 1884, p. 200.
[2] *Bull. gen. de Thérapeutique*, 1880, p. 1.
[3] *Progrès Méd.*, 1880, p. 690.
[4] *British Med. Journal*, 1889, ii. p. 1336.
[5] *France Méd.*, June 3, 1890.
[6] *Pacific Med. and Surg. Journal*, May, 1888.

Bristowe,[1] one patient working for ten, another for three years, with no treatment but occasional rest.

Ralfe[2] claims for galvano-puncture (*a*) prolongation of life in rapidly progressive cases; (*b*) relief of pain, undue pulsation, and paroxysmal cough; (*c*) the probability of an almost painless death, owing to slow oozing from the thickened sac, instead of sudden rupture, which if it occur internally must be extremely painful for a short time.

Others have found the method to be provocative of pain.

Another method of using electricity is that of Galeazzi and Vizioli—the external application of very strong currents, the positive pole on the aneurism, the negative on some indifferent point. The number of cases thus treated is small, but the method would seem to be worthy of further trial, especially as it is apparently free from some of the strong objections which are to be urged against the more radical electrical procedures. Of late years a considerable number of successes has been reported following the use of electrolysis combined with the direct effect of the presence of a foreign body—*i. e.*, gold wire. Hershey,[3] Bignoni,[4] Coulton,[5] Langton,[6] Stewart,[7] and Hare[8] have recorded successful cases—some of these cases being especially striking.

The introduction of foreign bodies into the sac, as a method distinct from acupuncture, was first practised by Moore in 1864. From a few inches to seventy-five yards of metallic wire, watch-spring, horse-hair, catgut, silken or sea-tangle threads, have been passed into aneurisms since then. In 1879, Corradi, and subsequently a few others, extended the method by the addition of galvanism—an addition which does not seem to have proved valuable. In what follows no distinction will be drawn between those cases in which galvanism was used and those in which it was not. There is little or nothing to add to the communication of Verneuil,[9] made to the French Academy of Medicine in 1888. He collected 34 cases in which the operation had been done, subjecting them to a rigid analysis. The conclusions of this eminent authority carry all the more weight in that he is a surgeon, and consequently not prejudiced against operative interference. In 18 of the cases the thoracic, in 4 the abdominal, aorta was the seat of the aneurismal dilatation; in 1 case the arch and innominate, in 1 the subclavian, and in 1 the femoral (*inguinale*) was involved. In 2 cases cure is reported. The more important of these is that of Morse[10] of San Francisco, who cut down on a traumatic

[1] *British Med. Journal*, 1889, ii. p. 1336.
[2] *Ibid.*, 1888, ii. p. 1162.
[3] *Therapeutic Gazette*, Sept. 15, 1896.
[4] *Centralb. fr. Sun. Med.*, June 6, 1896.
[5] *Manchester Med. Chronicle*, Sept., 1897.
[6] *Treatment*, May 25, 1899.
[7] *Brit. Med. Journal*, Aug. 14, 1897.
[8] *Therapeutic Gazette*, Jan. and Aug., 1900.
[9] *Bull. de l'Acad. de Méd.*, 1888, p. 18.
[10] *Pacific Med. and Surg. Journal*, 1887, xxx. p. 65.

aneurism of the abdominal aorta, and then introduced the wire, the patient being discharged from hospital eight weeks later apparently cured. His subsequent history is not known to the writer. The other case of cure was a man of twenty-two with aneurism of the brachial artery, probably easily curable by other means. In many cases the operation was directly fatal. Verneuil acutely observes that apparently imminent external rupture of the sac is a rather weak point on which to base a decision to operate. As a matter of fact, external rupture is a rare exception, and it is well known that cases in which such rupture *seems* imminent often live on for weeks or months, and then die from internal bleeding, or even from exhaustion. He also shows that in some cases, without manifest urgency, resort was had to operation before adequate trial was made of milder means. In short, he concludes that the operation under discussion is a failure alike with reference to palliation or to cure, and that its results are far less favorable than those of other surgical, or even medical, methods of treatment. He thinks abdominal aneurism less ill-suited to filipuncture than any other. These utterances of Verneuil were in reply to Lépine, and have been dwelt upon here as based on the largest collection of cases and the most careful analysis.

Macewen's Method.—Macewen[1] has recently reported 4 cases which he has treated by a new method. Under antiseptic precautions a pin tapering to a point like a sewing needle, as fine as is consistent with strength and long enough to transfix the aneurism completely, is passed through the sac until it comes in contact with the other side. The pin is then to be moved over the surface of the inner wall, so as to irritate it, for ten minutes; next another point is to be similarly scratched without removing the pin, and so on until the larger part of the sac-wall opposite the seat of puncture has been acted on in a methodical manner. In some cases puncture from various sides may be necessary. The pin should never remain more than forty-eight hours in the aneurism, and it is questionable whether all the advantages may not be won in a few hours; but its retention for twenty-four to thirty-six hours seems to produce a greater immediate effect. As a rule, distinct thickening of the aneurismal walls follows at an early period, though it may require weeks. The operation is not painful, and should be repeated as often as seems necessary. Lancereaux and Paulesco,[2] and Stoiesco,[3] have attempted to promote coagulation within the sac by the injection of gelatin (4.5 grammes of white gelatin to 200 c.c. of NaCl (7 per 1000) into the general circulation *via* the subcutaneous tissues. The fluid is carefully sterilized,

[1] *British Med. Journal*, Nov. 15 and 22, 1890.
[2] *Gaz. des Hôp.*, 1897, No. 71; *Practitioner*, May, 1899.
[3] *Jour. de Méd. interne*, July 21, 1899.

and under aseptic precautions 250 c.c. are injected deeply into the tissues of the buttock. The injection is repeated every six to eight days. The method is stated by its inventor to be painless, but in the hands of others has been found to cause so much suffering that cocaine, morphine, or both drugs, may have to be injected at the same time. The method has given good results in the hands of the author and of Huchard, but death has also been reported, owing to thrombosis and embolism resulting from coagulation of the blood in other parts of the system, and Carnot[1] and Trémolière[2] believe that the method is always a dangerous one. The latter authors prefer the subcutaneous injection of calcium chloride solutions as safer and equally effective.

The Distal Ligature.—A century ago Brasdor suggested the distal ligature for aneurisms so seated that it is impossible to tie between the heart and sac. As applied to thoracic aneurisms, the operation consists in the ligation of the great trunks arising from the arch, the carotid and subclavian, singly, consecutively, or simultaneously, while the aneurism must be of the ascending or transverse aorta or of the innominate. The sac is still exposed to the blood-pressure, though perhaps to a less degree; but thrombosis may extend backward from the ligature to the sac. Rosenstein[2] and Scheele[3] agree in the opinion that this operation has yielded better results than any other surgical procedure. The former has collected 32 simultaneous operations done since the introduction of antiseptic methods. Of these 14 lived one year or more, during which time they were able to work; 5 were greatly improved; 5 not benefited; and 8 died within a week. Similar but less good results have been won by the consecutive, and even by the single, ligature. Scheele says that sacculated aneurisms of the innominate are those in which the operation is likely to be of service. It may safely be stated as a general law that sacculated aneurisms offer a better chance to treatment of any kind, but the degree of sacculation can rarely be determined with much accuracy. For obvious reasons a traumatic origin renders one more willing to interfere than an origin in syphilis or atheroma.

Manipulation of the sac, as suggested by Sir. W. Ferguson for peripheral aneurisms, and also the injection into the sac of coagulating materials, are not methods which can be recommended for aneurismal tumors of the aorta.

If one can condense the results of the operative and electrical treatment of aortic aneurism into a few words, it must be confessed that they are not at present quite so discouraging as was the case ten years ago. It seems probable that the successes attributable to these methods

[1] *Presse méd.*, Nov. 16, 1898.
[2] Thèse de Paris, 1898.
[3] *Am. Journ. Med. Sciences*, Jan., 1891.
[4] *Therapeutische Monatshefte*, 1888, ii. p. 1.

are proportionally more numerous and greater than follow simpler treatment. We must remember, however, that some cases do remarkably well with little or no treatment, and that spontaneous cures are not absolutely unknown.

Dissecting aneurisms of the aorta and its main visceral branches are not amenable to any treatment except the administration of opiates.

Diseases of the Veins.

Phlebitis and Periphlebitis.—Inflammation within or about the veins—phlebitis and periphlebitis—is not properly to be discussed apart from venous thrombosis, its concomitant or antecedent. A frequent cause of phlebitis being the extension of neighboring inflammation, the prompt and intelligent treatment of such inflammation is the best prophylactic—early evacuation and skilful subsequent management of abscesses, removal of foreign bodies, etc. Varicose veins are liable to inflammation, and certain individuals, perhaps those of a gouty tendency, seem especially predisposed thereto. Phlebitis is a not uncommon sequel of the severe and long-continued infectious diseases, notably typhoid fever; also of parturition. We recognize, of course, that phlebitis is often an important factor in the healing of wounds, and a barrier against the entrance into the circulation of toxic agents or principles—a danger which is to be guarded against by the strictest possible antiseptic precautions. In the prophylaxis of the other main danger of phlebitis, embolism from the detachment of the clot or a portion thereof, absolute rest is the all-important thing. Until, therefore, the clot in the affected part has become absorbed, or so well organized that there is no risk of its passing into the blood-current, rest is to be maintained while direct pressure on the vein is avoided, and such a position is secured as favors the return of venous blood through collateral channels. The application of moist heat, the most convenient form of which is the poultice, certainly allays local pain and seems distinctly to promote reparative processes. Friction near the seat of inflammation should be avoided, but may be of service below if applied in the direction of the venous flow. Leeches and ice along the course of the affected vein are said by some to be useful, but the writer has no experience with them in this condition. The bowels are to be kept free. The choice of diet and the administration of stimulants are to be governed with reference to the state and constitution of the patient, rather than to the phlebitis. Pain may be sufficient to demand laudanum locally or an opiate internally.

If the clot is absorbed or the affected vessel is small, the circulation is promptly re-established. But if an important trunk or a considerable number of vessels in the same territory have become impervious, subsequent swelling and more or less disability persist until other chan-

nels become adapted to the work. While this process is going on a certain amount of rest is to be preserved, and skilful massage may be of great use. The support afforded by an elastic bandage, preferably of flannel and cut bias, permits greater use of a limb and promotes recovery.

Suppurative phlebitis is a grave condition, and is to be treated locally as a pyæmia, as well as with full diet, stimulants, and tonics.

Varicose Veins.—Unduly *dilated or varicose* veins are most common in the legs, scrotum, and rectum ; but may be met with in any portion of the body, in the deeper tissues as well as in and under the skin. Here, again, individual predisposition seems to play an important part, a similar degree of blood-stasis being followed in one person by varix ; in another not. There is no doubt, however, that all causes which tend to prevent free venous return from a part tend also to produce varix. Thus an employment which involves standing for long periods, and also tight garters, especially if worn below the knee, are likely to bring out any weakness that may exist in the walls of the veins of the leg; habitual constipation and straining at stool are productive of piles ; long-standing portal congestion from whatever cause is followed by fulness of, and often hæmorrhage from, the superior hæmorrhoidal veins ; other illustrations will suggest themselves to the reader. Prophylactic measures in any of these directions are in order as far as is possible. The extremes of life are more free from the condition than its middle period. Atony of the surrounding tissues, which thus fail to afford proper support, may also be added as a cause.

The broad principles of treatment of the developing or developed condition are clear and simple. Causes are to be removed as far as may be, though they may have been so long in operation that even after removal their effects persist and admit of only palliative treatment.

Varicosities of the legs may, in their early stages, be cured, much benefited, or, at all events, kept from getting worse, by rest in combination with other methods. If the recumbent position can be maintained for a few weeks, so much the better : if it cannot, as large a measure of rest as possible is to be secured at first. Walking is less deleterious than standing, the muscular contractions favoring the return of blood against gravity. Upward friction and well-applied massage are valuable adjuvants. If exercise is taken or walking is necessary, elastic pressure should be evenly applied before the horizontal position is quitted, and not left off until the legs are again raised to the level of the body. Circumstances must determine whether the pressure is to be obtained from an elastic stocking, from a rubber bandage, or from a flannel bandage cut bias. The pure-rubber bandage is a somewhat dangerous thing to put in the hands of a patient, who is apt to apply

it too tightly and thus obstruct the circulation. When it is used a layer of cotton batting should intervene between the bandage and the skin, in order that moisture may be absorbed and maceration of the skin prevented. The general condition of the patient should receive careful attention, the diet being made more or less generous, and stimulants being given or withheld according to the requirements of the particular case. The bowels are to be regulated, in free livers at least, preferably by salines. In cases of marked local varix a pad of cotton or lint may be firmly fixed by strapping with adhesive plaster. Rupture of a vein, sometimes proving fatal from loss of blood, the patient being, perhaps, far from medical or skilled attention, requires local pressure and elevation of the limb.

The cases in which a cure is effected by the foregoing methods are not numerous. Many people go about without any mechanical support, but with a considerable degree of varix, and suffer little or not at all for a long time; or they may have more or less weariness or pain, generally dull, in the legs. The condition is, however, apt to get worse more rapidly when thus let alone. The palliative treatment is troublesome and must be persisted in for years; but sufferers become gradually accustomed to this as to many other chronic ailments, and do not very often demand an operation for radical cure. The use of caustics with the aim of producing inflammation and obliteration of the dilated trunk is now obsolete. Another and better means of securing the same end is by passing needles behind the vein, and then winding silk, rubber, or wire about them. Subcutaneous ligature of the vein is well spoken of, and excision of a portion of the vein has also given good results. For details as to these and other strictly surgical modes of radical cure the reader is referred to standard surgical works.

The treatment of hæmorrhoids is considered in the article on Diseases of the Rectum and Anus, Vol. III. of this System.

Raynaud's Disease.

Vascular spasm is supposed to be the immediate cause of this affection, which is therefore classified here under diseases of the blood-vessels. The cause of the spasm is in most cases extremely obscure, and we are obliged to content ourselves with attributing it to idiosyncrasy. Malaria seems to be influential in some cases. Syphilis has also been thought to be a cause; but this disease would seem much more likely to produce impairment of the circulation through arteritis than through spasm. The relations of Raynaud's disease to hæmoglobinuria are of greater therapeutic interest than are its relations to scleroderma and peripheral neuritis: indeed, gangrene is the only feature of Raynaud's disease which can well be brought into close connection with neuritis. Cold and dampness are of etiological importance in some

cases, as is shown by the fact that the affection is more apt to originate in the winter and spring. But it does not always do so, and Raynaud[1] speaks of a Central American gentleman who came to Paris for treatment without obtaining relief. The same observer notes that attacks do not come on while the patient is in bed.

It is not in our power at present to prevent the disease, but something can be done to ward off the attacks in those known to be predisposed, by avoidance of chill and by warm clothing. Persistent galvanism and friction are also probably of value, and Barlow[2] relates a case in which the disease was kept in abeyance for two years by this means. Finally, the patient became weary of the treatment and abandoned it; severe gangrene followed by lymphangitis set in, and it was necessary to amputate the thigh. If attacks are repeated at short intervals, there is hope that by remaining in bed the liability may be overcome, at least for a time. Unfortunately, the disease seems to affect by preference classes of the community, feeble women and children in poor circumstances, who are unable to follow out prophylactic measures to the full. Between attacks patients should exercise in suitable weather as much as they can.

In the treatment of an attack it is our aim to try to restore free circulation as quickly as possible, thus alleviating the pain, which may be very severe, though it is sometimes absent, and diminishing the danger of consecutive gangrene. In mild cases it may be sufficient to wrap the part in cotton and place it near the fire. If tenderness is not too great, friction is to be used, but is not tolerated in the earlier stages of severe cases. In such, warm applications and galvanism are the best remedies. It is true that Southey found an ice-bag more grateful than warmth in one of his cases, but Raynaud has seen painful recrudescence after the cessation of cold irrigation. He also warns us against the use of such a decided rubefacient as mustard.

Galvanism was first used to the spine by Raynaud, with the idea of acting on the vaso-motor centres, but it is found that direct application to the limbs is more efficacious. Barlow advises immersion of the affected limb in salt and water with one pole of the battery, while the other pole is moved about on the skin above the level of the water. "The current should be rapidly reversed, made, and broken, and the patient should be encouraged to make voluntary flexion and extension movements of the limb during the time it is being galvanized." A change in hue from purple to pink shows that restoration is taking place, and galvanism should be kept up till this change is complete: friction can then generally be borne, and the patient should be urged to practise this himself. Another method of applying galvanism is

[1] *Selected Monographs*, New Sydenham Society, 1888.
[2] *Ibid.*; also *Illustrated Medical News*, April and May, 1889.

by "painting" the limb with the current, the poles being placed quite near each other. Lamp, vapor, and Turkish baths are also recommended. The occurrence of limited gangrene should not prevent a continuance of electricity above the affected area.

Mild cases of gangrene can safely be left to themselves, but major degrees may demand surgical interference—even amputation when the deeper tissues are seriously involved.

Internal medication has thus far proved nearly valueless in this disease, if we may except opiates for the relief of pain. A sufficiency of good food is important, and it may be desirable to give such remedies as tend to promote appetite and digestion, and also general tonics. The apparent close connection with vascular spasm naturally suggests the use of the nitrites, which have been repeatedly pushed to the point of headache and flushing of the face without producing the slightest change in the affected parts.

NERVOUS DISEASES OF THE HEART.

By SIR LAUDER BRUNTON, M. D., D. Sc., LL.D., Edin., LL.D. (Hon.) Aberd., F. R. C. P., F. R. S.

The nervous diseases of the heart may be divided into two classes, according as they affect the sensory or motor apparatus of the organ. These two classes are not altogether distinct, both the sensory and motor apparatus being sometimes affected together, but for the purpose of classification they can be distinguished from each other in a fairly satisfactory manner.

The motor affections may alter the strength or rate of the heart-beats, or both. Those which are usually recognized as nervous are palpitation in which the apparent strength of the beat is increased while the pulse-rate is unchanged, excessive rapidity of the pulse, or tachycardia, excessive slowness, or bradycardia, and irregularity of the pulse. The irregularity may affect either the number or strength of the pulse-beats, or both, and the form in which one beat is dropped in an otherwise regular pulse is designated as simple intermittence. These abnormal conditions may occur without its being possible to show that any organic disease is present, and they are then more particularly to be regarded as nervous.

The sensory affections of the heart occur in the form of uneasiness, oppression, or pain, and may vary from slight discomfort in the cardiac region to the intense agony of severe angina pectoris.

Physiology of the Circulatory Apparatus.

Before entering upon a discussion of the diseases of the heart, it may be advisable to give a short account of the physiology of the cardiac nervous system. This is extremely complicated, and a good deal of difference of opinion exists in regard to it. A description of it at this time must, therefore, not be regarded as absolutely true in all respects. All that can be done at present is to give such an account of it as will best correspond with the knowledge we possess, but it must be borne in mind that new discoveries may not only extend our knowledge, but may lead us to modify considerably the opinions we now hold. The nervous system of the heart and its relationships with other parts of the body are so complex that I may perhaps be

excused for trying to simplify their apprehension by employing a very homely illustration, and comparing the heart with its nervous system to a horse and its driver.

Cardiac Muscle.—It is now generally held by physiologists that the muscular fibre of the heart, like other muscles, both voluntary and involuntary, possesses in itself the power not only of contraction, but of *rhythmical contraction* apart from any nerves or ganglia. Such rhythmical contraction, however, of involuntary muscular fibre is usually displayed only when the muscle is subjected to a certain amount of stimulation. The muscular fibres are less sensitive to stimuli than the nervous, and consequently a smaller amount of stimulation will produce rhythmical contraction, if it can act upon the muscle through the nerves or ganglia, than if it acts upon the muscular fibre directly. The heart may thus be compared to a cart-horse which would stand still if no stimulus whatever were applied to it, but which would walk on rhythmically if stimulated by the prospect of a feed of corn when it reached its stable. It would do this even if blindfolded, but if its eyes were open the sight of the corn, acting through the nervous system, would stimulate it more readily.

Cardiac Ganglia.—But while the heart contains in itself the elements of rhythmical contraction, partly in its muscular fibre, and probably also in part in its intrinsic nerves and ganglia, so that it will beat for a considerable length of time after removal from the body, its movements while *in sitû* are regulated by the central nervous system.

Medullary Centres.—The chief centre by which the circulation is controlled and the beats of the heart are regulated both in strength and frequency, so as to suit the resistance which the organ has to overcome in driving the blood through different parts of the body, is situated in the medulla oblongata. In this part of the nervous system, closely related to one another, we have centres for the heart, for the blood-vessels, and for the respiration, so that the pulse, the blood-pressure, and the breathing may all be kept in harmony with one another. The centres here may be compared to the driver of the cart, who makes his horse move slowly by pulling the reins or quickly by using the whip, and increases or lessens the resistance to be overcome by putting on or taking off the brake when the vehicle is going down or up hill. The reins by which the heart is restrained or inhibited are certain fibres contained in the vagus nerves, the whip is contained in the sympathetic nerves, and the drag is the vaso-motor centre which contracts or relaxes the vessels so that the blood flows through them with greater or less difficulty, and thus a greater or less resistance is presented to the ventricular contractions.

Inhibitory Fibres.—The restraining or inhibitory nerves of the

heart, although contained in the vagus trunk, are really derived from the spinal accessory, while the other nerve-fibres contained in the vagus are probably sensory. The origin of the inhibitory fibres is shown by the fact that when the roots of the spinal accessory have been torn out, and the fibres proceeding from them to the heart have consequently degenerated in accordance with Waller's law, irritation of the vagus trunk ceases to have the power of slowing or stopping the heart which it would have in a healthy animal.

Inhibitory Apparatus in the Heart.[1]—The mode of termination of the inhibitory fibres in the heart has not been made out with certainty, but experiments upon the actions of certain poisons lead to the conclusion that just as the reins are rarely fixed directly to the horse's head, but end in a bit by which their action is increased, so the inhibitory vagus fibres end in some apparatus within the heart and act through them. This conclusion is, to a great extent, founded upon observations made on the heart of the frog. This may not be quite applicable to mammals, but in the absence of more definite information we are at present almost obliged to regard the nervous system of the mammalian heart as analogous to that of the frog. The experiments upon which our observation is founded show that if the vagus trunk be irritated by an interrupted current, the heart-beats are rendered slow, but if nicotine be injected in sufficient quantity, no irritation of the vagus will slow the heart, any more than the driver can stop his horse if his reins have been cut. But if the venous sinus of the frog's heart be stimulated after the vagus trunk has been paralyzed by nicotine, the stimulation will stop the heart, just as the driver might stop his horse by seizing the bit even after the reins were cut. If instead of nicotine we use atropine, neither stimulation of the vagus trunk nor stimulation of the venous sinus will stop the heart, any more than the driver can stop his horse if, instead of the reins being cut, the bit has fallen out of the horse's mouth.

Anabolic and Katabolic Actions.—The inhibitory vagus fibres, while slowing the heart, tend also to maintain or even restore its power, and, while lessening its action for the time being, will prolong the time during which it retains its irritability, in the same way as the judicious use of the rein, rather than of the whip and spur, has enabled men in a race for life across the prairies to reach their destination in safety, while others, who distanced them at the outset, have exhausted their horses and perished. Thus, if three animals be taken, all as nearly alike as possible, and the vagus nerves be cut in one, so that the heart beats much more quickly than normal, while in another they are stimulated, so that the heart beats more slowly for some time, and

[1] This view is not held by some physiologists, but it enables us to explain certain phenomena, and especially the action of poisons, more easily than any other view.

the animals be then all killed and the hearts excised, it will be found that the heart which beat more quickly than the normal perishes the soonest, while that which went slower than the normal outlives the heart of the animal which had not been experimented upon.

The power of the vagus to lessen waste and lead to the storing up of nutriment in the heart has been called by Gaskell anabolic, while its opposite effect—namely, the rapid action, and consequently quick using up of the nutritive material coincident with quick action of the heart, such as is produced by section of the vagus or still more by the accelerating nerves of the heart—has been termed catabolic.

Tonic Action of the Vagus.—In healthy men the inhibitory part of the vagus is always more or less in a state of tonic action, just as the driver gently feels the mouth of his horse and keeps it in hand. The extent to which the vagus restrains the beats of the heart in man has been approximately ascertained by the pulse-rate in cases of poisoning by belladonna or atropine, for in such cases the vagus is completely paralyzed by the poison, and the power of the inhibitory centre in the medulla over the heart is as completely destroyed as if the vagi had been cut across. In such cases the pulse-rate usually varies from 120 to 180. Most commonly it is between 140 and 150.[1] But belladonna and atropine not only destroy the power of the vagus; they stimulate to a certain extent the accelerating nerves of the heart also, for if small doses of atropine be injected into the circulation after the vagi have been divided, the beats of the heart are still further quickened.[2] We may perhaps not be far from the truth if we estimate the acceleration due to the stimulating effect of atropine as equal to ten, fifteen, or perhaps twenty beats per minute, so that we might not be far wrong in assuming that simple removal of the vagus tone would allow the pulse to beat at the rate of 125 to 135, instead of 65 to 75. At the bedside we meet so frequently with a pulse-rate of 120 that one is almost inclined to think that this may be a common pulse-rate when the vagus is inactive.

Accelerating Nerves of the Heart.—The accelerating nerves of the heart, which stimulate it to more rapid and forcible action, are chiefly contained in the sympathetic. The position of the accelerating centre has not been definitely localized. It may, like the inhibitory, be chiefly situated in the medulla oblongata, but acceleration can no doubt be produced by centres lying higher up in the cerebrum. The accelerating fibres pass down in the cervical cord and out by the rami communicantes to join the cardiac plexus. We do not know the exact

[1] *Ueber die Physiologischen Wirkungen des schwefelsauren Atropins*, von A. V. Bezold and Dr. Friedr. Bloebaum, p. 56.

[2] Lemattre, *Archives générales*, August, 1885; *Therapeutics*, by H. C. Wood, 7th ed., p. 296.

nerves through which they pass in man, but in the dog they leave the spinal cord in the anterior roots of the second and third, perhaps also the fourth and fifth, dorsal nerves. They pass in the rami communicantes in these nerves to the ganglion stellatum and first thoracic ganglion. Thence some fibres appear to go upward in the loop of Vieussens to the anterior cervical ganglion, and thence to the heart. Their course, however, is so complicated and varied that it is hard to give any exact account of it.[1]

Sensory Nerves of the Heart.—The vagus and accelerating nerves belong to the efferent class, and convey impulses outward from the centre in the medulla to the heart. They may, as I said, be likened to the reins and whip of the driver of a wagon. But the reins not only convey to the horse the wishes of the driver; they also convey to the driver the intentions of the horse; and in this respect the vagus and the reins resemble each other. For the vagus nerve not only contains efferent inhibitory fibres; it also contains sensory fibres, which convey impressions from the heart to the medulla, and not only produces reflexly such alterations in the contraction of the arteries and in the respiratory movements as will suit them to the needs of the heart, but may even produce pain more or less severe, and thus bring to a stop movements of the limbs or of the body generally when such movements are tending to put upon the heart a strain greater than it can well bear.

Work of the Heart.—But we must now turn from the heart itself to the work which it has to do. This consists in driving the blood into an elongated, branching, elastic tube, the aorta and arteries. This branching tube may be regarded as opening at one end through the capillaries into a nearly empty vessel, the veins. For the venous system is able to contain the whole of the blood in the body, and indeed does so after death, while during life it is so imperfectly filled as to present almost no obstacle to the flow of blood into it from the arteries.

Contraction of Capillaries and Arterioles.—The resistance which the heart has to overcome is therefore almost entirely determined by the difficulty with which the blood can flow out through the capillaries, and this again chiefly depends upon the greater or less amount of contraction which occurs in these vessels and in the arterioles with which they are immediately connected. When these are much contracted the blood flows out with difficulty, the tension in the arterial system rises, the resistance which the heart has to overcome at each beat is increased, and consequently the work it has to do becomes greater. On the other hand, when the arterioles and capillaries are dilated, the

[1] For a number of experiments on this subject see Schmiedeberg, *Ludwig's Arbeiten*, sechste Jahresgang, 1871, p. 34.

blood readily flows through them into the veins, the pressure in the arterial system sinks, and the resistance which the heart has to overcome is proportionately diminished.

But, as a rule, the arterioles are not equally contracted or dilated at the same time, for their calibre depends upon the need which the part of the body to which they are distributed has for more or less blood. The whole vascular system has been well compared by Ludwig to the water-supply of a large town, such as London, where, the quantity of water being insufficient to supply the whole town at once, the turn-cocks go about cutting off the supply from one district while they turn it on to another. As a rule, then, we find that when the vessels at one part are contracted, those of another are dilated, and *vice versâ*.

Vascular Districts.—There are three great vascular districts in the general circulation which have to be considered—viz. (1) the skin; (2) the abdominal viscera; and (3) the muscles. The vessels of the skin and the viscera are controlled by the vaso-motor centre in the medulla oblongata, and when this centre is excited the vessels both of the skin and of the intestine contract. As a rule, however, when the vessels of the skin are made to contract by the application of cold, and not by stimulation of the vaso-motor centre, the blood, being driven from the skin, passes into the internal organs and abdominal viscera. To some extent, at least, the vessels of the third district—namely, the muscles—are much less under the control of the vaso-motor centre than the other two. Perhaps indeed an arrangement exists in this centre such that it

FIG. 13.

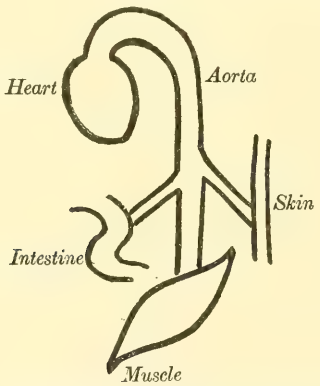


Diagram showing the three great areas of distribution of blood in the body—viz., the muscles, the intestine, and the skin.

actually causes them to dilate at the time when the others contract. It is obvious that if the heart stands still, the blood will continue to pour out from the arterial system into the veins, and that the pressure in the

arteries will consequently diminish steadily. One would suppose that irritation of the vaso-motor centre under such conditions would, by contracting the arterioles throughout the body, prevent the escape of blood into the veins, and thus stop the fall of pressure in the arteries. But this is not the case, for Ludwig and Hafiz found that when the heart was made to stand still and the vaso-motor centre was irritated, the blood seemed to pour out through the vessels of the muscles in such quantity that the pressure sank nearly as quickly as when the vaso-motor centre was not interfered with. This curious independence of the muscular vessels is probably of great importance physiologically, and must, I think, be borne very carefully in mind in considering the pathology of shock and syncope.

The calibre of the vessels in the muscles is regulated to a considerable extent by the vaso-motor nerves contained in the motor nerves of the muscles themselves, but their permeability to the flow of blood is also modified to a great extent by the mechanical pressure exerted upon them by the fibres of the muscle during its contraction. We would naturally suppose that the contracting muscle would require a greater amount of blood than usual in order to supply it with oxygen and nutriment, as well as to remove the waste products generated by its activity, and consequently would look for dilatation of its arteries. And, indeed, this is what we find, for stimulation of the motor nerve of a muscle not only causes its fibres to contract, but causes its blood-vessels to dilate, and the amount of blood which passes through to be consequently increased. This increase, however, is most marked after the contraction is over, for during the contraction itself the pressure of the muscular fibres on the arteries may be so great as to interfere very considerably with the passage of blood through them. The resistance thus opposed to the flow of blood from the arteries into the veins may be so great when many muscles are called into action that the general arterial pressure rises very considerably; indeed, as a rule, a violent struggle in an animal will raise the pressure within its vessels enormously. As the flow of blood through the muscle depends upon these two opposing factors, and perhaps still others not yet fully understood, the amount which passes through the muscular vessels during exertion varies very considerably; and while powerful contractions may sometimes arrest the flow entirely, gentle contraction may increase it considerably above the normal. Thus, while severe exertion may cause a great rise of blood-pressure, gentle or moderate exercise may distinctly lower it. To this point we shall have occasion to refer when discussing the pathology of angina pectoris.

We really know very little about the flow of blood through the muscles in man, although many experiments have been made by Ludwig and his scholars on the lower animals. We may assume that in its

main points the regulation of the circulation in muscles is the same in man and in animals; but in man we have to remember that the cerebrum is much more developed than in the lower animals, and that mental affections and emotions may have, and probably do have, a very much greater effect upon the circulation than they do in the lower animals. Although the circulation is certainly very greatly affected by emotion, even in the lower animals, yet we very rarely, if ever, find fainting as a consequence of emotion in them, whereas it is not uncommon in the human subject. During fainting the face becomes blanched and the whole surface of the body pallid. It is usually supposed that this is due to blood having left the surface and gone into the internal organs, but an observation of John Hunter's seems to show that the blood, in fainting, is really coursing with unusual rapidity through the muscles, and that the large area opened to the passage of arterial blood by dilatation of the arteries supplying the muscles leaves the ordinary channels through the surface empty. Hunter observed, while bleeding a lady who fainted, that while the faint lasted the blood which flowed from the vein, instead of being dark and venous, was of a bright scarlet, like that of arterial blood.[1] From the observations of Claude Bernard on the submaxillary gland we know that the arterial color of the blood in a vein is associated with dilatation of the capillaries, so that the blood streams so quickly into the vein that time is not allowed for it to assume its usual venous condition. Hunter's observation seems to show that while the skin of the arm was blanched, the capillaries of the muscles were so much dilated that the blood simply poured through them, and thus at the bend of the elbow it was arterial in character. This contraction and relaxation of the vessels which supply voluntary muscles independently of those going to the skin or to the intestines is, I think, a factor of much importance in regard to the circulation, and one which has hitherto received too little attention, for Ludwig's observation seemed to show that in a given time as much blood may pass through the muscles as would flow through both the skin and intestines together. We can thus see what an enormous effect any change in the circulation through the muscles may have upon the pressure in the arterial system generally, and consequently what a tremendous influence muscular exertion will have upon the heart, especially when the heart is weakened by disease.

It is obvious that the ranges within which the blood-pressure might vary are so great that they would be destructive to the life of the animal were it not that one factor usually counteracts another, and keeps the pressure more or less constant. As a rule, whenever the pressure rises in the arterial system, its increase acts as a stimulus to the inhibitory roots

[1] *Works of John Hunter*, edited by Palmer, 1837, vol. iii. p. 91.

of the vagus, and thus slows the pulse. Less blood is thus sent into the aorta, and the tension within it is brought to the normal and kept there. On the other hand, when the arterial pressure falls the ordinary stimulus to the vagus roots is diminished, the heart acts more quickly, and the tension in the aorta is thus again brought up to the normal. Besides this, whenever the tension becomes so great as to inconvenience the heart, the sensory nerves of this organ bring into action reflexly a mechanism for dilating the vessels. In the rabbit these sensory fibres pass upward from the heart as a distinct nerve, the depressor nerve, and when stimulated they cause great dilatation of the vessels in the abdominal viscera, so that the blood-pressure falls at once.

The exact situation of these nerves in man has not been ascertained, but in all probability a similar mechanism exists. The pulse-rate in health thus depends to a great extent on the pressure within the vessels. In disordered conditions of the nervous system it may vary to a great extent independently of this.

Motor Nervous Diseases.

Functional Palpitation.—In healthy conditions of the internal organs one ought to be completely unconscious of their existence, but in functional palpitation the patient becomes unpleasantly aware of his heart by feeling it throbbing. This throbbing may be confined to the heart itself or may be felt also in the vessels. In some cases the sensation which the patient feels is not accompanied by any change in the pulse or heart-beat sufficiently great to be perceptible to others, and the apex beat and pulse appear quite normal, although it is possible that the application of finer instruments of research might show that some change had actually occurred. In other cases, palpitation can not only be felt by the patient himself, but can readily be recognized by others, for the impulse of the heart's action against the ribs is forcible and hammering, and the pulse is frequently quickened, although in some cases the pulse may even be slower than usual. In regard to the conditions which actually are present in palpitation from mental emotion, the experiments of Couty and Charpentier, which are mentioned further on (p. 752), are very interesting, and in discussing the palpitation produced by digitalis I found that the cardiac contractions are actually increased in strength during the continuance of palpitation produced by this drug.[1]

The most common cause of palpitation is mental emotion of some kind, such as fright, joy, sorrow, expectation, and anxiety. These emotions will excite palpitation even in perfectly healthy, strong people, but they do so still more markedly in persons of a nervous

[1] *On Digitalis*, London, Churchill, 1868, p. 28.

temperament and feeble physique. Generally, women are much more liable to palpitation than men. In both women and men the tendency to palpitation becomes much greater when they are weakened by debilitated conditions, either mental or physical, such as anxiety, continued sleeplessness, over-work, over-excitement, hysteria, sexual excess, anæmia, chlorosis, and prolonged lactation.

Irritation of the vagus and vaso-motor nerves, whether central or peripheral, may also lead to palpitation, and it may therefore occur from hæmorrhage or tumor in the brain or spinal cord or in the course of the vagus or sympathetic tracts. Reflex irritation of the cardiac nerves, especially from the stomach, is a frequent cause of palpitation. It may occur from some distension of the stomach by flatus or by the presence of indigestible or irritating articles of food. In a case of distension of the stomach by wind a mechanical condition of the heart probably co-operates with the nervous cause of palpitation, for the stomach is separated from the heart only by the diaphragm, and when the stomach is distended it tends to lift the heart out of its normal position and tilt the apex more upward. A similar result

FIG. 14.

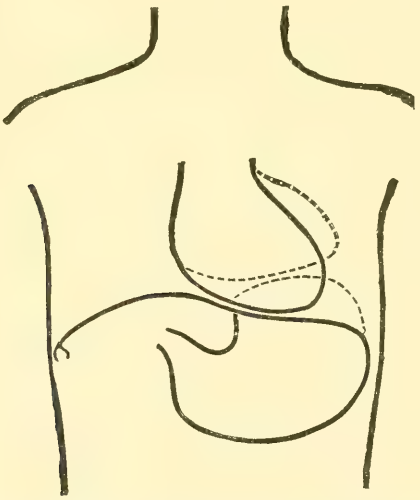


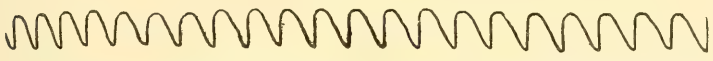
Diagram to show the effect of distension of the stomach on the heart. The unbroken lines show the normal position of the heart and stomach; the dotted lines show the position of these viscera when the stomach is distended.

may follow distension by a too abundant meal, as the effect of distension of the stomach would be nearly the same whether it were caused by gas or by solid or liquid food. Some cases of sudden death appear to be due to such distension. It is known to occur in animals that have fed upon damp clover, and one of the ancient methods of poisoning was to make the person swallow a large quantity of

freshly-drawn bull's blood. This, by forming a large solid coagulum in the stomach, would keep it permanently distended, and thus kill the person to whom it was administered. A case of sudden death which occurred a year or two ago in a man who had taken a large meal of potatoes and milk was probably due to the same condition.

Reflex palpitation may occur from irritation of the abdominal nerves, such as those of the intestine by scybalous masses in cases of constipation or by worms, irritation of the gall-duct by the passage through it of biliary grit or small calculi, by irritation of the kidney in renal colic, or, still more frequently, by the dragging of the renal nerves in cases of floating kidney. Irritation of the uterus and ovaries, either by congestive or inflammatory conditions or by malposition, such as prolapse, are a still more common cause of palpitation. One cause of palpitation which may be looked upon as partly direct and partly reflex is diminished blood-pressure, which may be caused by several conditions. When it occurs through dilatation of the arterioles, the heart, having little opposition to overcome, works, as I have said in a former paper, "fast and loose, like the driving wheel of a locomotive

FIG. 15.



Tracing of the pulse of a healthy young man in whom the vessels have been dilated and the heart consequently quickened by the inhalation of nitrite of amyl.

on a piece of greasy rail."[1] Palpitation may be occasioned in this way by exposure to undue heat, as in a Turkish bath, warm bath, or even warm foot-bath, or by lessening the pressure in the abdomen by the removal of fluid in ascites.

In exophthalmic goitre palpitation of the heart is usually one of the most prominent symptoms. It is usually accompanied by exceedingly rapid action of the heart, though cases are recorded in which the pulse has been abnormally slow.

TOXIC PALPITATION.

It is possible that the palpitation occurring in constipation, gout, and indigestion may sometimes be due to the absorption of toxines from the intestinal canal. At any rate, we know certainly that some substances are very liable to produce palpitation. Tea is a marked example of this, and more especially green tea. Coffee produces it in some persons, but not so frequently as tea. Tobacco is also a cause of palpitation, leading to pseudo-angina, which will be discussed later on. Position may give rise to palpitation, and some people cannot lie on their left side on account of the palpitation

[1] *Practitioner*, 1876, vol. xv. p. 311.

which they feel in this posture. The cause of this is not quite clear, but possibly it may be due to the mechanical irritation which the heart experiences from beating against the ribs in this position.

Stimulation of the skin over the cardiac region may occasionally give rise to palpitation, and I have seen one case in which it was brought on to such an extent by the application of ammonia over the left breast in a man that the treatment had to be discontinued.

Treatment of Palpitation.—In most cases of palpitation the person involuntarily presses his or her hand over the heart, and the warmth and pressure usually give relief. In persons who are liable to palpitation a substitute for the continued application of the hand may be found in the application of a plaster to the cardiac region. Any plaster that is warm and that sticks firmly will answer the purpose, but belladonna plasters are usually preferred, as they seem to have a more sedative action than others. In applying the plaster it is well to make some cuts in its edge, so as to allow it to adapt itself more accurately to the chest, and in females cuts may be made to allow the plaster to be applied close under the breast.

Some alcoholic stimulation, such as ½ an ounce of brandy, either pure or with its own bulk of water, will frequently stop an attack of palpitation, but in cases in which the attacks are frequent it is inadvisable to have recourse to alcohol, on account of the risk of inducing a habit. In such cases 20 or 30 minims of aromatic spirit of ammonia may be given in water, and this may be made pleasanter, and perhaps even more effective, by the addition of 10 minims of spirit of chloroform and 20 or 30 minims of compound tincture of cardamon.

The action of the heart may be greatly quieted by the administration of small doses, such as 5 minims, of tincture of digitalis, with the same quantity of tincture of nux vomica, three or four times a day; and when anæmia is present, 5 to 20 grains of carbonate of iron in the form of pill, twice or three times a day, will be useful. The bowels should be kept regularly open, and if the motions be pale, small quantities of a mercurial purgative should be administered from time to time, followed by a saline laxative. Where the palpitation is due to mental excitement, bromide of potassium, in doses of from 10 to 20 grains, with saccharin to flavor it may be given either when the mental excitement is felt or at regular intervals at bedtime or during the day. In cases of dyspepsia with irritability of the stomach bismuth and hydrocyanic acid will tend to lessen palpitation. A favorite prescription of the late Dr. Warburton Begbiès, both for functional palpitation and for gastric disorder, was—

℞. Bismuth. carb.,
Sodii bicarb., *āā* gr. x;
Pulv. nucis vomicæ, gr. iss;
Pulv. rhei, gr. ij;
Pulv. cinnamomi co., gr. iij.—M.
M. ft. pulv. ter die anti cibris sum.

This powder has a disagreeable taste unless administered in a wafer, and then it is rather too bulky for many patients to swallow. On this account I frequently give the disagreeable ingredients in a cachet and wash this down with a draught containing those which have no bad taste, thus,

℞. Bismuth. carb.,
Sodii bicarb., *āā* gr. x;
Spt. chloroform., ♏x;
Aq. cinnamomi, vel
Aq. menth. pip., q. s. ad f℥j.—M.
Ter die ante cibus sumend.
M. ft. list cum cachet uno.

℞. Pulv. nucis vomicæ, gr. ss–iij;
Pulv. rhei, gr. ss–x.—M.
M. ft. pulv. pone in cachet.

The quantity of nux vomica or of rhubarb in the cachet may be varied according as there seems greater or less need of stimulation or as the condition of the bowels require. Worms, if present, must be removed by vermicides, and if there be a floating kidney it should be supported by a pad, and any abnormal conditions of the genito-urinary organs must receive appropriate treatment.

Paroxysmal Heart-hurry (Paroxysmal Tachycardia).

In some persons the pulse-rate is constantly high, although there is no fever whatever. In one lady whom I knew the usual rate would be from 100 to 120, but she suffered from constant irritation in the rectum and sigmoid flexure with morning diarrhœa. This condition lasted for ten years. In other cases a persistently rapid pulse is associated with the presence of a floating kidney, although a floating kidney does not invariably give rise to this symptom.

In another class of cases the pulse is not persistently high, as in those that I have mentioned, but every now and again it is liable to sudden acceleration. To this condition the name of paroxysmal tachycardia has been given. These paroxysms may be—and indeed

generally are—accompanied with palpitation, and are sometimes associated also with difficulty of breathing and pain in the cardiac region, like that of angina pectoris. The difficulty of breathing is sometimes so great as to make the attack resemble one of spasmodic asthma. Cases of tachycardia seem to me to be so much associated with nervous palpitation, with angina pectoris, and with asthma, that it is difficult to draw a distinct line between them.

The attacks last for a time varying from a few minutes to several hours, though they may continue for some days. The frequency of the attacks also varies within wide limits between hours, months, and years. There is also no limit to be placed to the length of time during which the patient is liable to these attacks.

Paroxysmal Slowness (Bradycardia).

In some people the pulse is naturally very slow, and in a fellow-student of my own the normal rate continued to be 42 per minute for years. The slowness may occur in consequence of irritation of the vagus roots by inflammation about the brain or medulla, by pressure from a tumor, abscess, or hæmorrhage, or from irritation by a venous condition of the blood, or by drugs, such as digitalis or tobacco. It appears also to occur in some people from the use of tea or coffee, although this is quite exceptional. It is not uncommon in cases of jaundice, and its occurrence here appears to be due, according to Wickham Legg, to the weakening action of biliary acids on the cardiac muscle.

Slowing of the heart through stimulation of the vagus may be produced reflexly by irritation of the stomach, intestines, or abdominal organs in the same way as nervous palpitation. It may also be produced by the application of strong vapors, such as ammonia or chloroform, to the nose.

The prognosis, especially in elderly people, must be a guarded one, as the slow heart probably indicates a tendency to organic weakness.

The treatment is (1) to relieve the condition as far as possible where it is due to irritation, (2) to stimulate the heart by ammonia, nux vomica, and small quantities of alcohol, and (3) to maintain or increase the nutrition of the heart itself by good food, by iron where it can be borne, and by the elimination of waste material either by purgatives or diuretics.

Intermittent Pulse.

It is evident that if the cardiac diastole be prolonged at each beat to such an extent as to occupy the time usually allotted to two pulsations, the pulse will simply be very slow, but quite regular. If the diastole of each alternate pulsation be prolonged, we get the bigeminal

pulse, consisting of two pulsations succeeded by a prolonged interval, and if the diastole of every third pulsation be prolonged, we get a tri-

FIG. 16.

Slightly Bigeminal Pulse from Healthy Man in 1884.

geminal pulse, and if the intermittence occur at longer intervals than these, it is usual to speak of an intermission at every fifth or sixth beat, etc.

FIG. 17.

Bigeminal Pulse from same Man in 1891.

In some cases the intermissions are very regular, but in others they are irregular. Usually, the first beat after a long interval is fuller and

FIG. 18.

Trigeminal Pulse from Man suffering from Occasional Cardiac Pain.

stronger than the others. I have known a bigeminal pulse (Figs. 16 and 17) to last for many years in a gentleman of gouty diathesis, but strong and active, able and energetic, and in the enjoyment of complete health all the time. As Fig. 16 shows, he had it in 1884 and he is now, in 1900, perfectly strong and free from any symptoms of cardiac disease.

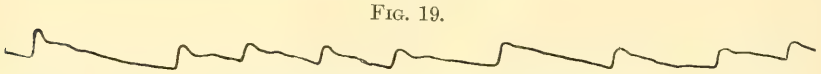
But the bigeminal pulse, where the beats are also feeble and where the twin character has come on in the course of a severe illness, is of a much more serious character, and makes the prognosis much more grave.

Causation.—The excessive use of tobacco is a common cause of intermittence of the heart. According to my experience, there are two kinds of cardiac disturbance to which tobacco gives rise. The one is accompanied by palpitation and great irregularity of the heart, two or three slow beats being succeeded by four or five quick ones, and these again by two or three slow ones again. This form I have usually observed in workingmen who smoke a coarse kind of tobacco in pipes. The other form is one in which the pulse may seem quite regular when it is felt, but the person suddenly drops down unconscious, as if shot. This form is more common in people belonging to the upper classes, who smoke finer tobaccoes, and especially take them in the form of cigars or cigarettes. Once the tobacco heart has been brought on by

excess, it may be kept up by the use of even a small quantity of tobacco, and in many cases the use of the drug must be entirely discontinued.

Intermittence of the pulse may come on from the same causes which lead to palpitation, paroxysmal hurry, or paroxysmal slowness, and in

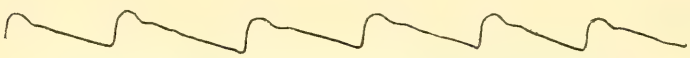
FIG. 19.



Tracing of the Pulse during Recovery from Poisoning by Digitalis, showing Abnormal Quickness alternating with Abnormal Slowness.

a case of poisoning by digitalis in 1865 I had an opportunity of watching these conditions appear during the process of recovery. When the

FIG. 20.



Tracing from the same Pulse later on, showing Abnormal Slowness.

patient was just recovering from collapse he had a very rapid beat of the heart, probably due to paralysis of the vagus. As he recovered

FIG. 21.

Normal Pulse in the same Case.

slow beats became interposed amongst the quick ones (Fig. 19); then the pulse became regular, but slow (Fig. 20), and finally returned to its normal (Fig. 21).

Prognosis.—Intermittence of the heart may last for many years, and I have known one case of a lady who died suddenly at the age of eighty-four in whom it had lasted for sixty-seven years. It is especially common in people of gouty families. When it begins to make its appearance in gouty people advanced in years it may be usually looked upon as an indication that the strength of the heart and of the cardiac muscle is beginning to fail, and that measures should be taken to prevent every strain, either from emotion or exercise, to prevent overloading of the stomach, and to increase elimination.

ANGINA PECTORIS.

THE great complexity of that part of the nervous system which regulates the movements of the heart and vessels and their relations to each other renders it very difficult to attain a definite knowledge of its

diseases, either functional or organic. Consisting as it does both of afferent and efferent fibres, and of ganglia connected with them, it is evident that we may have, theoretically at least, disorders of these nerves which lead either to motor phenomena alone, to sensory phenomena alone, or to combinations of both motor and sensory disorders in varying proportions. It is probable that in most disturbances, whether functional or organic, of the cardio-vascular nervous system we have both motor and sensory derangement; but in some diseases the motor phenomena chiefly predominate, and in others the sensory, and this predominance may occur to such an extent that we are led almost entirely to fix our attention upon one class of symptoms and to neglect the other.

In angina pectoris there is probably in many, if not in all, cases a certain amount of excessive action in the muscular structures of the vessels or of the heart, or of both, yet the most important symptom, and that which almost entirely attracts the attention both of the sufferer and the physician, is the sensory symptom of severe pain. In the most typical cases of angina this pain is not merely severe, it is perfectly agonizing, and is accompanied with a distressing sense of impending death. But all attacks of angina, even in the same person, are not equally severe; at one time it may amount to extreme agony, and at another to little more than slight inconvenience or depression, hardly deserving the name of pain. On comparing the pain in different persons, also, we find the same irregularity, for while some suffer severely, others suffer very slightly, and, moreover, the pain not only varies in degree and duration in different persons, but varies in character and site.

The problem which we have to solve in trying to ascertain the pathological significance of these degrees of pain is very complex and difficult. In trying to do it we may be greatly assisted by the analogy between the heart and the bladder which Grainger Stewart alluded to in discussing a paper by Douglas Powell. Both the heart and the bladder may be regarded as contractile bags, composed of voluntary and involuntary muscular fibres which contract and dilate at regular intervals. During their stage of dilatation or diastole they become filled with fluid, which flows into them from the veins in the case of the heart, and from the ureters in the case of the bladder. Their rhythmical movements of contraction and dilatation are regulated by the central nervous system, but when cut completely away from it they both continue to contract rhythmically of themselves, and to expel the fluid with which they are filled. In both cases they have to expel the fluid against a certain amount of resistance, which is offered, in the case of the heart, by the contraction of the circular muscular fibres in the walls of the arterioles and the friction of the blood in the vascular sys-

tem, while in the case of the bladder the resistance is offered by the contraction of the circular band of muscle forming the sphincter vesicæ and the friction of the urine against the walls of the urethra. In the case both of the heart and of the bladder we have such a nervous arrangement as tends to prevent the contractile walls of the viscus and the opposing muscles of the arterioles or the sphincter from contracting simultaneously, at least to their full extent. This is the condition of health, not only in the heart and bladder, but also in other hollow viscera, such as the stomach and intestines. In all of them a certain amount of tone may exist in the fibres which oppose the exit of the contents of any one of these viscera during the contraction of its muscular walls; but when this contraction takes place to its utmost the resisting muscles in each case tend to relax and allow the contents of the viscus to escape. When the innervation of any one of these viscera is so dis-

Fig. 22.

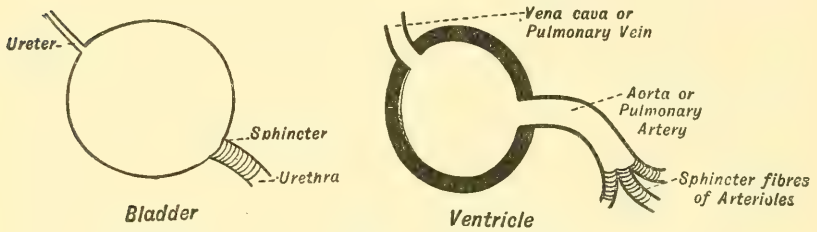


Diagram to Illustrate the Comparison between the Bladder and the Heart.

turbed that its walls contract, and the opposing muscles, instead of relaxing as they ought to do, also contract, we get pain as the result. In the stomach we get distension by gas, or painful retching instead of the vomiting which might give relief. In the intestine we also get pain when its walls are distended by flatus which cannot escape; and in the case of the bladder, when the urine is prevented, either voluntarily or involuntarily, from issuing when the viscus is fully distended, we have painful sensations, which may vary, just as in the case of the heart, from the slightest discomfort to the extremest agony. In all these hollow viscera distension leads to discomfort or pain in greater or less degree, but in the bladder at least the distension depends, to a certain extent, upon the amount of contraction in its wall; for if this contracts powerfully when the bladder is only about half filled, a distressing sensation and desire to micturate will be felt, which passes off entirely when the contraction ceases, and may remain absent for some time, although the bladder is gradually becoming considerably fuller than it was before. Again, contraction may set in accompanied by pain, and again this passes off, and alternate contraction and relaxation may continue until the bladder is fully distended and the pain becomes

excessive, when it is relieved by evacuation, either through the natural passage, by rupture, or by operation. We see, then, that in the bladder discomfort or pain is due to the attempt of the viscus to contract against the resistance which it is unable for the time to overcome. I believe that the same is the case in the heart, and that *cardiac pain is generally due to weakness of the heart in proportion to the resistance which it has to overcome.* This may not necessarily mean that the heart is weaker than usual. It may be that the resistance is abnormally increased; though, on the other hand, it may also mean that while the resistance remains normal, the contractile power of the heart has become weakened, at least for the time.

Pain is usually of peripheral origin, and is useful in giving the organism a warning of some injurious condition which ought to be removed. Thus, pain in the bladder indicates the necessity for evacuating it, and leads the individual to take steps to accomplish this and to prevent injury; pain in a joint usually indicates some inflammation, and leads the individual to give it rest, and thus allow time for repair and restoration to health. But although pain is usually originated by peripheral irritation, the actual seat of painful perceptions is in the cerebrum, and intense sensations of pain may be felt by a patient although there is no peripheral cause for them whatever; and they are then almost certainly due to some condition of the perceptive centres in the brain. We find this in hysteria, where patients have complained of intense pain in the knee-joint, which has led to amputation of the leg, subsequent examination showing the limb to be absolutely healthy. But we may have pain which originates neither in the periphery nor in the centre, but in the paths which connect the two. Thus on striking the "funny bone" we not only get discomfort or pain at the point where the ulnar nerve is actually struck, but we get disagreeable sensations in the fingers; and men whose legs have been amputated frequently suffer from pains which they refer to a corn on the amputated leg, although years may have elapsed since the member itself has crumbled into dust. The pain in such cases appears to be due to irritation of the nerves in the stump, which, like the blow upon the ulnar nerve, is referred by the sensory centres of the cerebrum—not to the nerve-trunk, but to the terminal filaments from which the nerves of sensation would ordinarily proceed.

In a similar way irritation of the sensory tracts in the spinal cord may give rise to intense pain, which is referred by the sensorium to the periphery, just as is the case in irritation of the nerve-trunks. Thus in sclerosis of the posterior columns we get lightning pains which are referred to the extremities, and also severe pain accompanied by disturbance in the stomach, intestine, and bladder. It is quite probable that the same thing may occur in regard to the heart, for Charcot notes

that in the gastric crises of tabes the pulsation of the heart is usually violent and precipitate and the pulse markedly accelerated, although Rosenthal has seen a case in which the pulse was slower than usual during the attack. It is quite possible also that pain may be referred to the heart, although its seat may be entirely confined to the sensorium, and both the heart itself and the nerve-trunks and spinal cord, which connect it with the sensorium, may be quite healthy, just as in the case of the hysterical knee-joint. We know, indeed, that irritation of the trunk of the vagus nerve will produce a feeling of great discomfort in the cardiac region, just as irritation of the ulnar nerve will cause it in the fingers. But the heart is so readily affected by the brain that it is very difficult to find proof of any pain referred to the heart being of purely cerebral origin, and existing without any alteration in the heart itself. The vagus—or, as the Germans call it, *der Herumschweifendenerv*, from its wandering course to the heart, lungs, liver, and intestines—is pre-eminently the nerve of emotion, and almost all the emotions can be expressed in terms of the vagus. Thus, "the heart beats high with hope," "his heart sank within him for fear," "his heart fluttered with anxiety,"—all express the effect of these emotions on the stimulating and depressing fibres of the vagus, or mixed effects on the two respectively. The borborygmi, which were used by the ancient writers as a synonym for compassion, the jaundice, which was ascribed to jealousy, and the well-known loss of appetite or sickness which bad news produces, indicates the actions of the intestinal, hepatic, and gastric branches of the vagus respectively.

One might be disposed to look upon emotions as entirely cerebral conditions, were it not that they manifest their effects so distinctly upon the organs just named; and upon the heart, especially, emotion may act so powerfully as to cause death even in young and otherwise apparently healthy people. Thus Livingstone observed that a great number of slaves who had been torn from their homes died, and when asked what they suffered from they laid their hands upon their hearts, although they knew nothing whatever about anatomy. In many emotions, and especially those that are of a painful character and arise suddenly, the hand is naturally carried to the heart on account of the discomfort felt there. This discomfort, although caused by the emotion, is probably of a peripheral nature, for it may exist after the emotion itself has ceased, as I myself have experienced.

To recapitulate shortly, we may say that in all probability pain in the heart may arise either in the organ itself, in the sensory paths either of the nerve-trunks or spinal cord which connect the heart and sensorium, or in the sensorium itself, although any pure affection of the latter character is probably extremely rare. Though it is theoretically possible that pain referred to the heart may exist in

the sensorium alone, it is nevertheless probable that in almost all cases emotional disturbance or other changes in the cerebrum lead to alterations in the function of the heart itself, and that these alterations, rather than the disturbance in the brain, give rise to cardiac pain.

But cardiac pain may differ not only in its origin, but in its nature, and it seems to me that we have at least two kinds of pain, one of which is felt as distension from within, so that the heart seems as if it would burst, while the other is felt as oppression from without, like a giant's hand compressing the chest. The feeling of bursting is familiar to many, for it occurs during or after exertions which are too great for those who undertake them, such as running quickly to catch a train, especially if carrying a heavy portmanteau, or trying to climb a Swiss mountain while out of training. That this condition is associated with actual distension of the right ventricle I had a good opportunity of ascertaining some years ago. In crossing the Théodule Pass at Zermatt my guides began to walk up a steep ascent so quickly that in attempting to follow I got an intense bursting sensation in the cardiac region, with dyspnœa. The discomfort led me to place my hand over my heart, and, to my astonishment, I found that the apex-beat had disappeared from its normal position and that there was marked epigastric pulsation. On calling to them to go slower, they slackened their pace, and as the cardiac discomfort and dyspnœa gradually disappeared I found that the apex-beat gradually left the epigastrium and returned to its normal position.

The heart has two sides and four cavities, and the bursting sensation may occur in any of them. Possibly it may be more usually felt in the ventricles, for the vascular districts of the systemic and pulmonary veins, with which the auricles communicate, will dilate if the tension in the auricles becomes too great, and will thus relieve over-distension. The ventricles, on the other hand, have no such means of relief unless their distension is extreme.

I have already pointed out that in the bladder the contraction of the distended viscus upon the fluid within it gives rise to pain, and probably the same occurs with the heart. The right ventricle, when much distended, may to a certain extent be relieved by some backward flow of blood through the tricuspid valves, but the left ventricle is not so favorably circumstanced in this respect, and one would therefore expect that over-distension in it would give rise to much more acute pain than in the case of the right ventricle. At the same time we should also expect that if the mitral valves were incompetent, so as to allow the left ventricle to relieve itself into the auricle and pulmonary veins, the pain of distension would never become so extremely great; and apparently something of this sort does occur. The second kind

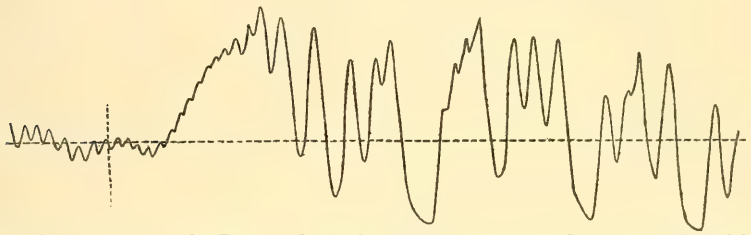
of pain is that of compression from without like the grasp of a giant's hand upon the thorax, and the name of *Beklemmend*, given to it by the Germans, is exceedingly descriptive. This sensation was first shown by Czermak to depend upon irritation of the vagus. He had a small exostosis upon one of his cervical vertebræ,[1] and by pressing the vagus between his finger and the exostosis he was able to irritate it to such an extent as to slow his heart, and at the same time this sensation of *Beklemmung* came on. His experiments have been repeated by Concato and Quicke, and, indeed, any one by pressing firmly upon the vagus will probably soon experience a sense of oppression that obliges him to desist. Thus in severe migrain the pain in the head is often greatly or entirely relieved by firm pressure upon the carotid, but the thoracic oppression, which is probably due to the vagus being compressed at the same time as the carotid, soon obliges one to give up the pressure notwithstanding the great relief which it affords to the pain in the head.

Pain almost exactly resembling that described by Czermak as the result of the compression of the vagus may be brought on by painful emotions. It may, however, exist completely apart from these emotions, and may persist after the emotion which caused it has passed away. I have noticed this in my own person, for one day while walking in Hyde Park I suddenly became conscious of a sensation of constriction or *Beklemmung* across the chest. It was so uncomfortable that it forced itself upon my attention, and I began to wonder what had caused it. I was walking slowly and the ground was level, so it could not have been exercise; but on puzzling over it I recollected that it had come on near a particular tree some hundred yards back, and that while passing that tree I had been thinking of some painful subject. The painful thought had, however, completely passed away, and had been succeeded by others of an indifferent nature, and still the cardiac discomfort not only persisted, but increased, or at least engrossed my attention more. That painful emotions affect the heart through the vagus has been very clearly shown by Couty and Charpentier, as is illustrated in the accompanying tracing, which they obtained by connecting a kymograph with the arterial system of a dog paralyzed by curare (Fig. 52). The cries which another dog uttered on its toes being trod upon produced in the curarized dog very much the same effect as would have been caused by strong stimulation of the vagus. At the same time, however, it will be noticed that the vaso-motor centre appears also to have been stimulated, and the arterioles consequently contracted; for, despite the slow action of the heart, the blood-pressure is considerably

[1] In his paper Czermak described it as an enlarged cervical gland, but I have been assured by the late Professor Sharpey that this was a mistake, and that the supposed gland was really an exostosis on one of the cervical vertebra.

raised, and only falls below the normal during an exceptionally long diastole of the heart. That this slowness of the pulse is due to the effect of emotion on the heart through the vagus is shown in another

FIG. 23.



Effect of Emotion upon the Pulse and Blood-pressure in a Curarized Dog. The dotted horizontal line indicates the ordinary level of the blood-pressure; the upright dotted line indicates the time when another dog began to howl, and thus excited the animal experimented on. (After Couty and Charpentier.)

tracing taken under similar circumstances, with the important exception that the vagi has been previously divided (Fig. 24). Here it will be seen that emotion greatly raises the blood-pressure without

FIG. 24.

This tracing shows the effect of Emotion on the Blood-pressure in a Curarized Dog. The effect on the pulse is prevented by previous section of the vagi. The dotted lines have the same signification as in Fig. 23. (After Couty and Charpentier.)

slowing the pulse. This rise of pressure, due to emotion, is, I believe, a very important factor in the production of angina, and I shall return to it again later.

It is evident that emotion may have a very complex effect upon the heart, and may under different circumstances produce the feeling of *Beklemmung* due to the action of the vagus, or may give rise to the feeling of distension produced by the excessive resistance which contracted arterioles oppose to the flow of blood through them, and the consequent difficulty the heart has in emptying itself. This feeling is also mentioned in popular language, for people frequently say their hearts feel as if they would burst from grief.

It must be borne in mind that the inhibitory fibres of the vagus not only cause the heart to become slower and weaker, but they tend also

to make it dilate beyond its normal size; and such dilatation, it appears to me, renders the organ still more susceptible to the effects of a distending force from within.

The expression "a broken heart" is not found to correspond with the result of *post-mortem* examination; but a persistent cardiac pain, ending in death, may be originated by grief, as in the case of the slaves observed by Livingstone, to which I have already alluded. Of course in such cases as these it is exceedingly difficult or impossible to decide how far the cardiac depression was an exciting or merely a predisposing cause of death; for the weakened circulation would render the slaves more liable to succumb to infectious diseases, malarial or otherwise, by which they might be attacked.

In trying now to apply the physiological data which we have already obtained to the explanation of cardiac pain in general, and of angina pectoris in particular, we may recapitulate in a few words the facts already mentioned. These are that distension of any hollow viscus, as a rule, acts as a stimulus to pain. This pain usually increases with the amount of distension, or rather with the amount of stretching force exerted upon the muscular fibres of the hollow viscus. Thus in the bladder discomfort or pain becomes greater as the bladder gets fuller and the muscular fibres become more stretched; but a spasm of increased pain may and does come on when the bladder contracts. This contraction increases the pressure upon the contents of the bladder, but at the same time it also increases the pressure exercised by the contents upon the bladder-walls, and when these relax so that the pressure again diminishes the pain caused by their stretching tends to cease.

In discussing angina pectoris it may help us if we bear in mind that the most marked symptom of angina is pain—that it is really pain in the heart, though it may be very difficult to draw the line exactly between what every one would call pain and slight forms of cardiac discomfort which no one would call angina; but between these two extremes we find many intermediate forms, differing from one another by very slight degrees, so that hardly any difference may be distinguishable between adjacent members of the group, although the extreme members may be very different indeed. As Dr. Grainger Stewart pointed out, the analogy between the heart and the bladder may help us considerably. While the bladder, stomach, intestine, as well as the heart, all consist of hollow bags of involuntary muscular fibre, both the heart and bladder have a certain resistance to overcome —namely, that afforded by the friction of the urine passing through the urethra, and the resistance caused by a contraction of the sphincter vesicæ in one case, and the friction of the blood in the arteries along with the contraction of the walls of the arterioles in the other. In

both cases there are nervous arrangements for preventing the over-distension of the viscus, and when the pressure in the bladder becomes great the sphincter relaxes. When that of the heart becomes too great the vessels dilate or the heart itself goes more slowly. In both cases we find that the nervous arrangements may be disturbed, so that spasmodic retention may occur in the bladder and over-distension in the heart. In both cases over-distension is associated with pain, and I believe that in both cases the amount of pain may vary, as I have already said, from the slightest discomfort to the severest agony.

But distension only occurs when the contraction of the muscular walls of a hollow viscus is not sufficiently powerful to overcome the resistance opposed to the exit of its contents. Whenever the resistance yields, and the bladder, stomach, intestine, or heart is allowed to empty itself, the pain is relieved or disappears entirely; but in the case of the bladder or the stomach we sometimes find that the muscular fibres of the walls remain in a state of contraction or spasm so great that a few tea-spoonfuls of fluid seem sufficient to produce a sensation of distension and excite the organ to renewed contraction. It is quite possible that a similar condition may sometimes occur in the heart, and that the "irritable heart" and "irritable bladder" may be perfectly comparable to each other; but neither of these conditions gives rise to intense pain, unless there be some obstruction to the heart or the bladder emptying itself of its contents. We may, I think, lay it down as a rule that intense pain in any hollow organ is due to distension arising from the inability of the organ to empty itself of its contents. It is evident that this inability may be of twofold origin: it may be due either to increased resistance, or to the diminished power of the expulsive muscles. In applying this general rule to the case of the heart we may say that cardiac pain is dependent on increased resistance to the onward flow of blood, or diminished power in the heart itself. It is evident that a combination of these two factors will be still more likely than either one alone to produce cardiac pain, and in searching for the cause of angina pectoris we are most likely to find it in a combination of those leading on the one hand to cardiac weakness and on the other to increased resistance.

It will, perhaps, be most convenient to discuss first the conditions which give rise to increased pressure in the aorta and the arterial system generally. The first is mental emotion, as shown in the tracing already given; the second is bodily exertion. There are few physical conditions, if any, which raise the blood-pressure in an animal so high as does sudden exertion or struggle. The cause of this probably is that the arteries passing through the muscle become compressed by the thickening of the fibres which occurs during muscular contraction; but a counterbalancing condition occurs at the same time, for the muscular

fibres which form the walls of the arteries dilate at the time when the muscle contracts. The consequence of this is that the flow of blood through a contracted muscle may vary considerably; sometimes it may be stopped entirely, at other times it may be diminished, while at others, again, it may be considerably increased above the normal, according as the mechanical pressure upon the muscular arteries or the dilatation of their walls is most marked in the particular instance. In almost all cases, however, the flow of blood through the muscle after its contrac-

FIG. 25.

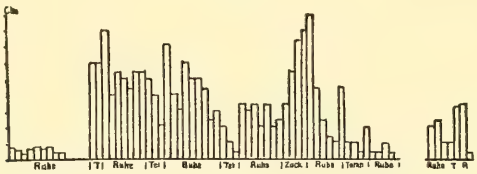


Figure showing the amount of blood which flows through a resting and a contracting muscle respectively. The marks along the base line indicate seconds; the height above the base line indicates the amount of blood flowing from the veins of the biceps of a dog during tetanus (T or tet), during rest (Ruhe), or during simple contraction (Zuck). (After Ludwig and Sadler.)

tion becomes greater than usual, an increased supply of blood being apparently requisite for mammalian muscles to perform their functions thoroughly. In consequence of this twofold condition in muscles it frequently happens that while sudden exertion may raise the blood-pressure in the aorta, continued exercise may rather lessen it, the mechanical effect of the muscular contraction upon the arteries being more evident at first, while afterward the arterial dilatation is more evident. A third cause of rise in arterial pressure is sudden stimulation of a sensory nerve; and a fourth is the application of sudden cold, either to the surface of the body or to the stomach, giving rise to contraction of the vessels of the surface or of the digestive tract, and thus causing a rise of general pressure.

The exciting causes of angina pectoris are precisely those which I have just mentioned as raising the blood-pressure.

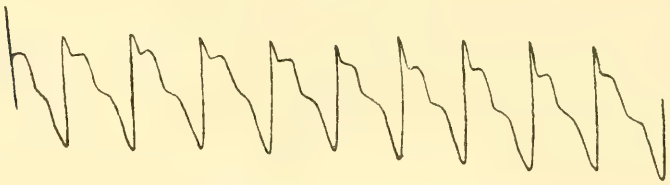
The effect of emotion is well shown in the case of John Hunter, and the most common cause of angina pectoris is the exertion of walking up a hill; but in such cases, especially where the disease is just beginning, though the attempt to ascend a hill may cause pain at first, yet afterward, if the pain passes off and the exertion be continued, the individual may be able to walk for miles, and indeed make considerable efforts, without any return of the pain; which is precisely what we would expect from what has already been said regarding the condition of the vessels in the muscles after continuous exercise.

But the rise in pressure which we have just been considering can only be looked upon as an exciting cause of angina pectoris, for it does not occur in healthy people. One condition which is very apt to lead to angina pectoris is gouty kidney, for this is associated with a high blood-pressure due to diminution in the calibre of the systemic arterioles. Although it is unnecessary to discuss here whether this diminution in calibre is due to a thickening of the walls of the arterioles by arterio-capillary fibrosis, as believed by Gull and Sutton, or to contraction of the muscular walls of the arteries, as thought by George Johnson, it is evident that where the pressure is already high, as in the case of a man suffering from gouty kidney, any sudden increase in it, either from emotion or exertion, is more likely to cause distension of the heart and consequent pain. Yet there are many men suffering from gouty kidney who do not get angina pectoris, and we must now look for its causes not only to the arterial system and the resistance which the heart has to overcome, but to the power of the heart itself to overcome this resistance. When we come to analyze post-mortem appearances in cases of angina pectoris, we are at once struck by the fact that in the great majority of cases conditions are present which either weaken the heart considerably or tend to lessen its power of meeting, by increased contractile power, any call that may be made upon its powers by a sudden rise in the resistance it has to overcome.

A fatty condition of the heart is naturally one of the most powerful causes of lessened contractile power, and fatty heart has been frequently noted as a post-mortem appearance in cases of fatal angina pectoris; but an inelastic condition of the aorta, with calcification of the coronary arteries, has been noted much more frequently still. At first it seems difficult to understand what connection a calcified condition of the coronary arteries can have with pain in the heart itself; but when we remember that one of the concomitants of muscular action is dilatation of the vessels which supply the muscle with blood, we can understand that rigid arteries, rendering such an increased supply impracticable, might naturally lead to weakened contractile power, and therefore to pain. In addition to this there may be another factor, and that is disturbed nervous supply; for the interior of the aorta is naturally sensitive, and mechanical irritation of it has been shown by François-Franck to lead to wide-reaching reflex results, among which modification of the respiration is well marked. Such disturbance may in its turn lead to increased resistance to the onward flow of blood, and this in its turn to cardiac distension. That some such disturbance is a powerful factor in the production of pain in angina is, I think, clearly demonstrated by the tracings which I took in a case many years ago, and which first led me to use nitrite of amyl as a remedy for the disease. In a healthy body increased tension within the blood-vessels stimulates the vagus

roots and causes the heart to beat more slowly, so that, less blood being thrown into the arterial system, the diminished outflow through the arterioles is compensated and the pressure remains nearly normal; but in this case I found that simultaneously with the appearance of pain

FIG. 26.



Normal pulse of the patient.

the pressure rose and the pulse became exceedingly rapid (Fig. 27). The form of the pulse-tracing showed that the arterioles were greatly con-

FIG. 27.

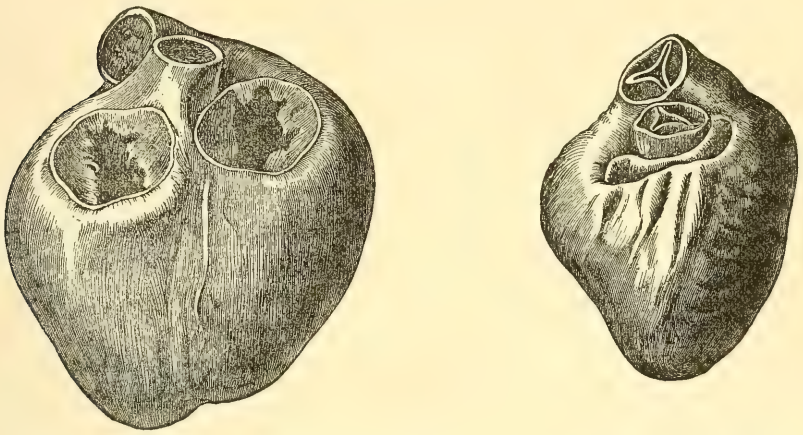
Pulse of the same patient during severe pain from angina.

tracted—so much so, indeed, that during the cardiac diastole a very small proportion of blood was able to flow into the veins, and consequently the pressure remained high during the diastole, instead of sinking as it would ordinarily have done. In this case, which was one of angina pectoris with aortic regurgitation, the blood had an opportunity to run backward into the heart, as well as onward through the arterioles into the veins, and yet the tension remained high during the diastole. This condition can only be explained by contraction of the arterioles, and the high tension which would necessarily result in the heart is, I think, the cause of the pain. This idea, taken in connection with the fact that bleeding usually relieves the patient for the time being, led me to use nitrite of amyl, and the result completely confirmed my expectations. But it may be said that my observations disproved my hypothesis, because I found that after relieving the tension in the arterial system by the use of nitrite of amyl pain still might persist, though to a less extent. This, however, I believe, was probably due to the right side of the heart being involved as well as the left; and when the drug had completely produced its physiological action of dilating all the vessels in the body, the pain disappeared and did not return.

I have already drawn attention to the fact that relief to distension lessens the pain in hollow viscera, and from this fact we naturally expect that the right side of the heart would suffer less than the left, because the right ventricle, when over-distended, is more readily

relieved by the auriculo-ventricular orifice dilating and the blood regurgitating into the auricle and veins between the flaps of the tricuspid valve, which then became incompetent to close the dilated orifice. Dilatation of the mitral orifice occurs much less readily, and therefore the distended left ventricle cannot relieve itself so easily, and is much more likely to suffer pain in consequence. It has been noted, however, that when mitral regurgitation occurs the pains of angina pectoris become less frequent and severe, or may disappear altogether in cases in which they formerly existed. (See Fig. 28.)

FIG. 28.



The Heart in Full Dilatation and in Full Contraction. It will be seen that in complete dilatation the auriculo-ventricular valves, though healthy, can with difficulty close the dilated orifices. (After Macalister.)

In children also, where the cardiac walls are much less hard and resistant than in adults, we would naturally expect angina pectoris to be much less frequent, as the left ventricle would be likely to discharge itself into the left auricle and pulmonary veins, in much the same way that the right ventricle does in adults. Eichhorst mentions two cases of children in whom angina pectoris occurred. One case was that of a boy aged fourteen years, who was suffering not merely from aortic incompetence, but from mitral stenosis; and in this case one would expect that the contracted mitral valve would tend to prevent any free dilatation of the mitral orifice and relief of the ventricle by free regurgitation. In the other case, which was that of a boy aged eleven years, the auriculo-ventricular ring was to a great extent calcified, so that the enlargement of the mitral orifice and regurgitation would be prevented.

The factors which we have now considered in the pathology of angina pectoris seem to indicate that the pain is due in most cases to cardiac distension, caused by the resistance in front being too great for

the ventricle completely to overcome it, while at the same time relief by regurgitation is prevented. The increased resistance may be either absolute or comparative. It may either be greater than that which would occur in a healthy person, or may simply be too great for a weakened heart, although probably in most cases the resistance is above the normal and the cardiac power is below the normal. In all cases, however, there is a disturbance of the vascular nervous mechanism, which would tend, either by slowing the heart or dilating the vessels, to adjust the action of the one to that of the other, and thus to keep the blood-pressure at the proper height, neither allowing it to fall too low nor to rise too high. The nervous mechanism, in all probability, may undergo central disturbance, and thus we may have attacks of angina pectoris of an epileptic or hysteric nature, and more especially they may be caused by emotional disturbances. We may also have them from disease of the nervous paths in the spinal cord, as in the case of locomotor ataxia, or of the cardiac nerves, as by tumors; and in all probability we may have also reflex disturbance, caused by derangement of other organs. One case which I saw some years ago was probably an instance of one or other of the last-named varieties, though it would be hard to say whether the pain was due to implication of nerves or was reflex from a neighboring part of the body. The case was that of a man aged thirty-six, who complained of pain in the chest under the left nipple, shooting through to the back and running down the left arm as far as the elbow. During the attacks his medical attendant found that the pulse was not quite regular and that the face was pale. He had taken nitrite of amyl, but it seemed only to make him worse. On pressure over the sternum opposite the second and third costal cartilages I found that it was excessively tender and slightly swollen. I learned that he had suffered from syphilis twelve years before. I advised the use of iodide of potassium. In a short time after beginning the drug his pain left him and did not return. Here the anginal pain might be due to reflex irritation from a commencing node over the sternum, or might possibly be due to thickening, involving some of the cardiac nerves.

The high arterial tension which occurs in cases of gout is a very powerful agent in bringing on the attacks. Not only does the arterial tension do this directly by the increased resistance it offers to the heart, but gout is frequently liable to render patients very irritable and give rise to those emotional disturbances which are sometimes fraught with such fatal consequences. For both reasons, therefore, it is very important to cause free elimination both from the bowels and from the kidney.

In a case which I saw lately, a seaman aged thirty-nine, with a hypertrophied heart and a soft systolic murmur at the apex, the pain

came on acutely over mid-sternum, and was limited to an area the size of a crown-piece opposite the insertions of the fourth and fifth cartilages. Nitro-glycerin did him no good, and when walking he was obliged to stop every fifty yards on account of the pain. Iodide of potassium, in 10-grain doses thrice daily, greatly relieved him, but he seemed to receive more benefit from sulphate of magnesium, in drachm doses three times a day, than from either of the other remedies.

A form of elimination not much in vogue, but which is sometimes exceedingly useful, is bleeding, and in the case in which I first used nitrite of amyl bleeding invariably prevented the recurrence of the pain for one night, when without it an attack would have been certain to occur. The natural indication for relieving the pain at the time is certainly to lower the blood-pressure, and this is most rapidly and efficiently done by the administration either of a nitrite or of some other substance which acts in the same way as a nitrite. Nitrite of amyl is the one which is the most commonly used, but, according to the recent researches of Cash and Dunstan, the nitrites which act most powerfully are the following, the first being the most energetic: (1) secondary propyl; (2) tertiary butyl; (3) secondary butyl; (4) isobutyl, nearly equal; (5) tertiary amyl; (6) α-amyl; (7) β-amyl, nearly equal; (8) methyl; (9) butyl; (10) ethyl; (11) propyl.

Of these substances, the isobutyl has already been used with good effect. Along with Mr. Tate, I investigated the physiological action of nitro-glycerin in 1876, and showed that its action was the same in character as that of nitrite of amyl. On account of the headache which it caused Mr. Tait and myself, I hesitated to give it to patients, but in the following year it was successfully introduced into medical practice by Dr. Murrell. Both nitro-glycerin and nitrite of sodium, recommended by Dr. Hay, have the advantage over nitrite of amyl that they can be more readily used to keep up a steady diminution in the blood-pressure, and the plan of giving small doses of nitro-glycerin at frequent intervals during the day is sometimes most advantageous. The best way of doing this is to break up a chocolate nitro-glycerin tabloid into many pieces, which are put into a *bonbonnière*, and one of them taken every ten minutes or quarter of an hour. In this way the action is never very great, but is kept up with a considerable amount of constancy during the whole day. Some experiments which Mr. Bokenham and I have made with hydroxylamine have shown it to have an action on the blood-pressure almost exactly like that of nitrite of amyl. I find that in angina pectoris it relieves the pain in much the same way as amyl nitrite or nitroglycerin. It seems to me that its action lasts longer than that of either nitroglycerin or organic nitrates; but it is likely to cause intestinal irritation with pain and looseness of the bowels. Professor Leech showed that all nitrates

have the effect of lowering the blood-pressure in the same way as nitrites, though to a less extent. Their action lasts longer, however, than that of nitrites. Nitrate of potassium may be used to lower the arterial tension more or less permanently. For this purpose it may be given in a dose of 20 grains along with 30 grains of bicarbonate of potassium, in a large soda-water tumbler full of water every morning. I have known a very gouty medical man who took this dose for forty years or more every morning apparently with great benefit. Instead of this large dose in the morning, smaller doses of 5 to 10 grains may be taken two or three times a day.

A number of other organic nitrates were examined by Bradbury—glycol (ethyline) dinitrate, erythrol tetranitrate, arabinol pentanitrate, and mannitol hexanitrate. The only one of those which has proved of much use in medicine is erthyrol tetranitrate, and it gives very satisfactory results indeed. I think it is inferior to amyl nitrite, isobutyl nitrite, or nitroglycerin for cutting short an attack of angina, but I think it is superior to them for preventing the attacks. For this purpose it is best given in tablets made with chocolate like those of nitroglycerin. The dose of erythrol tetranitrate is much larger than that of nitroglycerin, and each tablet contains $\frac{1}{2}$ a grain instead of $\frac{1}{100}$ of a grain. The patient may begin with quarter of a tablet three times a day, and increase the quantity as may be found necessary. Three or four tablets daily sometimes suffice to prevent pain altogether.

But while we may try to avoid sudden increase of tension from exercise or from emotion, and to diminish the excessive tension in cases of gouty kidneys by free elimination and by an almost entirely vegetable diet—while we may lessen the tension during the attack by nitrites and allied remedies, we must think at the same time of the enlargement of the heart and try to increase its force as best we can.

The first and foremost, perhaps, amongst the drugs that are really efficient in tending to prevent the recurrence of the attacks in angina pectoris comes iodide of potassium in doses of 5 to 30 grains three times a day. Whether this acts as a simple eliminant, or whether it tends to increase the blood-supply to the heart by causing absorption of the deposits which block the coronary arteries, or whether it acts in some other way, we cannot at present tell, but about its practical use there can be no doubt whatever. In cases of fatty degeneration we may combine elimination with the administration of iron and of arsenic, Schott's system of baths and exercises or with restriction of fluids, and Oertel's method of gently graduated exercise may be exceedingly beneficial if used with great caution, but if used carelessly they may be most injurious and greatly shorten the patient's life.

In cases in which the patient is too weak to take exercise, or in which the least exertion brings on pain, massage may be used. This causes a change in the circulation similar to that produced by exercise. It raises the general blood-pressure at first and reduces it afterward, but by beginning the massage very gently the primary rise may be kept sufficiently low not to bring on pain, whilst the heart is strengthened, the arteries rendered less rigid, and tissue-change improved by the increased circulation which the massage produces.

DISEASES OF THE STOMACH.

By THOMAS G. ASHTON, M. D.

ACUTE GASTRITIS OR ACUTE GASTRIC CATARRH.

To this most common of gastric disorders many individuals seem to have a special predisposition, which in some appears to be decidedly hereditary. Such individuals, possessing a "weak stomach" as it has been termed, cannot partake of the quality or quantity of food ordinarily digested without difficulty by the normal stomach, without being subjected to an attack of acute gastritis. These cases are frequently those that give no history of dietetic abuse to which the enfeebled digestion can be ascribed, and yet they have always been liable to attacks of the disorder. In fact, in many of them the history of heredity is evident from the statement by the patient that a parent or several members of his immediate family suffer in the same way.

Acute gastritis is usually to be ascribed to errors in the diet both as regards the quantity as well as the quality of food ingested. If more food be taken than the stomach can digest, irritation of the mucosa results, followed finally by the changes incident to an acute inflammation. In this sense, that is as a local irritation, every case of acute gastritis is, as pointed out by Ewald, in reality a toxic gastritis. The same may be said of those cases of the disease arising after the ingestion of food of improper quality which, during its retention in the stomach, undergoes decomposition and fermentation, the products of which act probably as a local irritant and excite an acute gastric catarrh. These foods may have already undergone decomposition or fermentation at the time of ingestion, and particularly is this true of butter, of eggs, and of articles of diet prepared from eggs; it is also true of the milk and milk-foods partaken of by children, which so readily undergo fermentation during the warm seasons of the year. The fermentation of food after it has reached the stomach seems to depend upon the absence of hydrochloric acid, as in every case of acute gastritis this constituent of the gastric juice is wanting. Just exactly what the product of decomposition is that produces the irritation of the stomach resulting in acute gastritis does not seem to be definitely determined. That it is not due to lactic acid Ewald[1] con-

[1] *Klinik der Verdauungskrankh.*, Bd. ii. S. 162.

cludes from the fact that this substance is normally present, for instance at the beginning of the digestion of food, and that the medicinal administration of lactic acid, as well as its ingestion in such substances as kefir and koumyss, is unattended by any harmful results to the stomach.

As to whether acute gastritis occurs as the result of infection is still a question that requires to be definitely settled. It is extremely doubtful that such an affection prevails as the result of a direct invasion of the stomach-walls by micro-organisms, with constitutional infection. Inasmuch as this form of gastric infection has not been demonstrated, the contention of Lebert that a special infectious form of the disease occurs is not proven, although the occurrence of acute gastritis apparently in epidemics would tend to confirm his view. This latter circumstance, however, is susceptible of the explanation that the greater number, at least, of those cases of so-called infectious gastric fever are in reality instances of the mild forms of enteric fever. Acute gastritis usually accompanies most of the acute infectious diseases, especially at their onset.

Treatment.

A knowledge of the etiology of acute gastritis will aid us materially in instituting an efficient therapeusis. It teaches us that the affection is not of spontaneous occurrence, and that it is always induced by the direct introduction into the stomach of some irritating substance. Of course, the indication is the removal of the source of irritation.

In mild cases the stomach cares for itself, and by spontaneous emesis gets rid of a large quantity of the irritating substances, while the remainder, passing into the intestines, finds evacuation in the diarrhœa which its presence there excites. Under ordinary circumstances, therefore, the patient recovers without the use of drugs, except possibly a mild purgative, and abstinence from food. In most cases fasting is self-regulative, as the complete anorexia accompanying the affection prevents the patient from taking food for twenty-four hours or more. Thus the stomach not only obtains needed rest, but further irritation is avoided.

In severe forms of acute gastritis, requiring the interference of the physician, the treatment should be carried on in such a way that the spontaneous efforts of the stomach and intestines at relief may be aided. When vomiting has not spontaneously occurred, and epigastric distress and fulness indicate that the stomach is full, we must take measures to empty it, especially when the eructation of foul-smelling gases associated with pyrosis indicates that the retained gastric contents have become decomposed. While this may best be brought about by the use of the stomach-tube, it is more feasible, perhaps, to first employ other means, as to most of these patients it would imply

the introduction of the tube for the first time, and therefore in many of them would excite alarm and augment their distress. Hemmeter strongly recommends the evacuation of the stomach with the tube and its subsequent disinfection by washing it out with a solution of thymol and boracic acid (thymol, 0.5 ; acid. boracic., 16 ; warm water, 500). This treatment, which nearly always relieves the vomiting, should be supplemented by washing out the colon six hours afterward with a 10 per cent. solution of boracic acid. When lavage is not resorted to, one of the simplest means of emptying the stomach, and one which the people have learned to practise for themselves, is to direct the patient to drink a pint or more of tepid water in which a small quantity of common salt has been placed. The finger may then be carried as far as possible down the throat in order to induce vomiting. In many cases this is unnecessary, as to a good many people the tepid water is in itself sufficiently nauseating to produce emesis.

Should these means prove insufficient the use of emetics may be resorted to, although their use is inadvisable on account of their local irritant effects and the additional distress they cause the patient. As possessing the least of these disadvantages apomorphine, administered hypodermically in doses of $\frac{1}{10}$ of a grain, should be used. In children emetic doses of ipecacuanha or of tartar emetic may be used, but the employment of these drugs is not advised in adults. Should constipation exist and continue for several days, resort must be had to the use of some mild purgative ; otherwise no medicine is required in the majority of cases. For this purpose probably the best results are obtained from calomel given in a single large dose of 10 grains, to an adult. Should there be delay in its action it may be followed by one of the mild saline aperients, these remedies in themselves being of very great service. If the effects of calomel be not desired, therefore, we may order Seidlitz powders, a glass of Hunyadi water, or citrate of magnesia, the contents of the bottle as ordinarily purchased being divided into equal doses, the second dose being taken about four hours after the first, should further action be desired. I am in the habit of employing smaller doses of this remedy with greater frequency of administration, and under these circumstances order a tablespoonful or two tablespoonfuls, to be given every hour until the desired effect is obtained. Bicarbonate of soda, subnitrate of bismuth, or other alkalies and antacids may be given if marked pyrosis exist and if the patient be greatly troubled thereby.

For the first day or two the stomach should be allowed almost complete rest from food. Indeed, the extreme anorexia from which the patient suffers practically secures this rest for the stomach, and it is a good plan not to force food upon the patient until he begins to experience a craving for it. For the first twenty-four hours after the

stomach has been emptied, therefore, no food should be administered, the continued irritability of the organ and the thirst from which these patients usually suffer being relieved by the swallowing of small pieces of ice or of small quantities of carbonated water. During the second day food of the lightest possible character may be given, such as milk and lime-water, or a combination of equal parts of milk and Vichy water, some one of the clear broths or soups, strained oatmeal, milk-toast, and the like. As the case progresses we pass to more substantial articles of diet, such as rice, oatmeal-gruel, a soft-boiled egg, buttered toast, and oysters; and later on, as improvement continues, scraped beef, a small chop or small piece of broiled steak may precede the gradual return to the ordinary dietary.

TOXIC GASTRITIS.

This term is usually restricted to those cases of gastritis that arise from the swallowing of substances that directly affect the gastric mucosa, producing either an inflammation of an intense degree, or, as is the case in many of them, causing a more or less extensive destruction of its tissue. Among the substances having this effect when swallowed may be mentioned the mineral acids in a concentrated form, the caustic alkalies, the metals and metallic salts, such as arsenic, phosphorus, corrosive sublimate, potassium chlorate, and other substances such as alcohol, nitro-benzol, and carbolic acid.

The damage done the stomach by the ingestion of any one of these substances depends upon the exact nature of the poison and the amount that has been taken, as well as upon the condition of the stomach at the time, whether full or empty. In the case of the corrosive poisons not only may the mucous coat be involved, but the underlying tissues down to the serous covering may be entirely destroyed and converted into a charred and blackened slough; in this event perforation of the serous coat occurs, and the contents of the stomach find their way into the peritoneal cavity. Alcohol and phosphorus, and drugs acting in a similar manner, produce a very intense form of inflammation, with much swelling of the mucous membrane, accompanied by superficial necrosis and minute blood-extravasations; and by a microscopical examination the glandular structure is observed to have undergone a mucoid and fatty degeneration.

Treatment.

The treatment of toxic gastritis consists theoretically in the prompt evacuation of the stomach-contents; or, failing in that, as in the case of the corrosive poisons, their neutralization and dilution. In all cases of acute poisoning not due to corrosive substances, the stomach

should at once be emptied with the stomach-tube in order that that portion of the poison not as yet having entered the small intestine may be removed, and the further general intoxication of the patient prevented. The use of lavage in these cases is much to be preferred to the administration of an emetic, as the stomach can in this way be more thoroughly cleansed. Lavage is inadmissible in all cases of corrosive poisoning when danger of perforation exists, and if the nature of the poison swallowed be in doubt, inspection of the mouth and pharynx will usually reveal whether or not it be due to any caustic substance. Under these circumstances, therefore, we must rely upon our efforts to effect the neutralization of the unabsorbed portion of the poison that remains within the stomach. In the event of poisoning by an acid this may be accomplished by means of calcined magnesia given in the proportion of about 3 ounces of the magnesia to a pint of water or milk; in the case of the mineral acids a harmless compound is thus formed. If the poisonous substance ingested has been an alkali its neutralization must be brought about by the drinking of lemonade, vinegar, or a weak solution of tartaric or acetic acid. Within the limits of the present article it is impossible to mention all the antidotes of the various poisons, and only these very general lines of treatment can be laid down.

The individual symptoms are to be treated upon general principles. To overcome the condition of profound collapse into which many of these cases rapidly pass it is necessary to surround the patient with artificial heat and to freely stimulate. This latter procedure is rendered impossible by way of the stomach on account of the intense inflammation of the organ and the persistent vomiting usually accompanying the affection. It becomes necessary, therefore, to depend largely upon the hypodermic administration of stimulants, and in this way we may employ strichnine, digitalis, or the more readily diffusible stimulants, such as whiskey, brandy, aromatic spirits of ammonia, and ether. Stimulants may also be given by way of the rectum, and in some cases much advantage is obtained by the rectal administration of black coffee given hot, which not only stimulates directly but also tends to overcome the patient's subnormal temperature. The urgency of the vomiting may be assuaged by the swallowing of small pieces of ice or small quantities of some aërated water or a dry champagne, and for the relief of this symptom good results are sometimes obtained by the frequent administration of small doses of cocaine. The pain attending a severe case of toxic gastritis is usually agonizing and calls for the free administration of opium or one of its derivatives. Unfortunately in many of these cases treatment is simply palliative, and our services to the patient are limited to keeping him as comfortable as possible until death relieves his suffering.

PHLEGMONOUS GASTRITIS.

Purulent gastritis or suppurative inflammation of the stomach is an extremely rare form of inflammation of the stomach; it is more common among men than women and is most frequently met with between the twentieth and sixtieth years. It differs from simple acute gastritis in that the lesion does not exist in the glandular layer of the stomach but in the submucous and muscular structures, in which numerous small abscesses are usually found. The mucous membrane covering the areas of lesion is greatly swollen and infiltrated, and in advanced cases, through implication of the serous coat, perforation occurs into the peritoneum or, by sloughing of the mucous membrane, into the stomach. In size these abscesses vary within wide limits. The disease exists in two forms, the idiopathic or primary and the metastatic. The exact cause of the former is as yet unknown, but it is probable that it is due to a direct infection of the stomach by some pus-producing form of organism. The metastatic variety occurs as a part of a general pyæmia, or accompanies puerperal fever or at times the exanthematous diseases.

Inasmuch as the diagnosis of the affection is rarely possible during life, the outline of treatment can only be symptomatic. Whenever a diagnosis can be made the treatment of the condition by surgical means would seem to be indicated.

CHRONIC GASTRITIS, CHRONIC GASTRIC CATARRH, CHRONIC GLANDULAR GASTRITIS.

There appears to exist in the minds of many such an imperfect conception of what the term "chronic gastric catarrh" or "chronic dyspepsia" actually implies that a short description of the usually accepted varieties of the condition and the pathological changes taking place seem to be called for. This confusion seems the more remarkable as chronic gastric catarrh is one of the most frequently-met-with disorders and preponderates in all of our large dispensaries. It can be explained only by the fact that much carelessness still exists in the diagnosis of diseases of the stomach, and that the lessons imparted by modern methods of investigation go unheeded. It should first be understood that the term "dyspepsia" should be employed only in a symptomatic sense, leaving the underlying cause still to be looked for. For so long a time has this term been used synonymously with the affection about to be discussed, that it is of the utmost

importance that we understand the true cause and the symptoms of the disease, for without this correct treatment is impossible.

Chronic gastritis may be said to depend upon causes that act directly upon the stomach, and are therefore primary; and upon those that act upon the stomach secondarily—first, as the result of changes in the circulation dependent upon lesions of other organs; and, secondly, as the result of changes in the state of the blood itself dependent upon general conditions.

The primary causes of chronic gastritis include all forms of local irritation to the mucous membrane of the stomach. Therefore the ingestion of all substances rendered irritating and difficult of digestion by improper mastication, as well as particles of food with which the saliva has been inadequately admixed and thereby predisposed to fermentation when reaching the stomach, constitute direct irritants to the gastric mucous membrane and are therefore causal in the production of chronic inflammatory changes.

Again, the use of such irritants as alcoholic beverages in a concentrated form, highly seasoned foods, and the irritating condiments will, if sufficiently prolonged, result in the establishment of the disease. In the same manner a carious condition of the teeth should be regarded as etiologically important, for the reason that from this source there may arise putrefaction and decomposition of the retained particles of food and secretions of the mouth, which upon subsequent swallowing constitute sources of irritation leading eventually to inflammation. Here should also be included those cases of chronic gastritis arising from the direct local inflammatory changes accompanying new growths and cicatrices in the mucous membrane, as well as those resulting from the irritation produced by the existence of various forms of parasites within the cavity of the stomach or in some portion of the gastric wall. Repeated attacks of the acute and subacute varieties of the disease frequently lead to chronic gastritis, and this can the more readily be understood when we consider that many of the causes of the former are also productive of the latter. Nor must we overlook the functional disorders of the stomach as causes of the chronic structural changes constituting chronic gastric catarrh.

The secondary causes of chronic gastritis, or those due to changes in the circulation and alteration in the condition of the blood, result, in the first place, from all those conditions giving rise to venous stasis and congestion of the mucous membrane of the stomach. These conditions may be looked for in those diseases of the liver and spleen that produce obstruction to the portal vessels, as well as in chronic disease of the heart, either primary or dependent upon lesions of other organs, as of the lungs. Under any of these conditions the resulting venous congestion of the stomach will lead eventually to

chronic inflammatory changes, and to afford relief to the chronic gastric catarrh it is primarily necessary to relieve the condition upon which the venous congestion depends. As the result of the excretion of toxic substances into the stomach attending the blood-alterations incident to such general diseases as the infectious fevers, chlorosis, and profound anæmia from any cause, as well as gout, diabetes mellitus, chronic nephritis, and tuberculosis, the mucous membrane of the stomach is rendered more than normally sensitive to ingested irritants; hence these conditions predispose to chronic gastritis. In the case of chronic nephritis the excretion of urea in the stomach is probably the causative element, and the same may be said of the absorption into the blood, and subsequent excretion in the stomach, of the putrefactive products arising in the intestinal canal.[1]

Treatment.

The treatment of chronic gastritis must begin with the regulation of the diet, a precaution quite as important as the treatment of the disease by drugs. It is self-evident, however, that the diet must vary with each individual case, and that each individual in this respect must be separately considered. It is, therefore, impossible to prescribe a definite diet-list suitable for all cases, a fact that is readily understood when we consider the varying degree with which the secretory glands are affected and their function disturbed, as well as the differences in the susceptibility to certain classes of food exhibited by even normal individuals. In a general way it may be said that a case of chronic gastric catarrh should be limited to simple and easily digested foods, or foods rendered easy of digestion by artificial means, as without such aid in many cases digestion cannot be properly performed. Even here, however, individual experience must cause the dietary to vary, for what is easy of digestion to one is difficult to another, and what the normal stomach may find easy to prepare for assimilation is difficult to the diseased organ.

In many cases of chronic gastric catarrh a diet of milk must, at least for a time, be resorted to. Although patients soon tire of it, and, as has been stated, a diet exclusively of milk is in a measure effecting a cure by slow starvation, yet in severe and obstinate cases such a strict regulation of the diet becomes necessary. The objection that such a quantity as it is possible to give a patient does not afford sufficient nutritive principles to properly maintain life upon its use alone, is counteracted by the addition to it of milk powders, consisting of milk which has been evaporated to dryness and then pulverized. It is estimated that one hundred grammes of this are the equivalent of one litre of milk; so that the addition of such a quantity to the milk

[1] *Op. cit.*, S. 203.

taken imparts to it greatly increased nutritive qualities. Milk may be administered in its ordinary state or as buttermilk, or it may be previously peptonized. In some cases the addition of Vichy water, a small quantity of bicarbonate of sodium or of common salt will render it more easy of digestion.

In cases of less severity than would call for a strict diet of milk, such a regimen may be supplemented by foods in a semi-liquid form, such as soft-boiled eggs and soups prepared in milk and thickened by thoroughly boiled rice or barley; or well-cooked oatmeal, rendered thin in consistence and carefully strained to remove the indigestible shells of the grain, may be given with advantage. We may also allow the twice-baked or toasted breads, such as zwieback, with a small allowance of butter; tender meats, prepared without fats, therefore roasted or broiled, may be rendered more easy of digestion by scraping. Care should be taken, however, that all fatty and tough portions are removed, and that the meat is not from animals that have been recently slaughtered. In a general way we may say that all meats that contain much fat, and the fatty fish foods, should be avoided, as they readily undergo decomposition in the stomach and are therefore indirectly harmful. The condiments and the concentrated alcholic liquors should be forbidden because of their irritant effects, but weak tea and cocoa may, in most cases, be allowed. After a patient has thus been dieted for several weeks a more liberal allowance of food may be given, and here it may be said that the vegetables and fruits in general are of advantage; and that bread, if well baked and not too fresh, may be allowed. It should be borne in mind, however, that these substances, on account of their saccharine constituents, readily undergo fermentation, and that they should be carefully prepared and used with caution. Especially is this care necessary in all atonic states of the stomach and when the tendency to gastrectasis exists, as in these conditions the prolonged detention of carbohydrates in the stomach promotes their fermentation.

The patient with chronic gastritis should eat more frequently than the normal individual, and at least four meals should be partaken of in the twenty-four hours. He should exercise care in mastication and should eat slowly, and as far as possible dismiss from his mind business and other cares while eating. The meals should not be too large in bulk, and under all circumstances the patient should cease eating before the appetite has been fully satisfied.

The use of mineral waters is undoubtedly of advantage in many cases of chronic gastritis. The best results are to be obtained from saline and alkaline saline waters. The former, containing small or large amounts of carbonic acid, are to be preferred in most cases of the disease. From practical experience their effect appears to be to

increase the production of the gastric secretion and to increase the appetite, as well as to influence favorably the motive power of the stomach. This class of waters is not indicated when marked gastric atony exists or where a high grade of gastrectasis has occurred.[1] In the group of saline springs belong Soden, Homburg, Wiesbaden (*Kochbrunnen*, warm), Kissingen and Sarotoga, Congress Spring.

When constipation exists as a troublesome symptom better results are obtained from the alkaline saline waters, which contain chiefly sodium sulphate, sodium chloride, sodium carbonate, and free carbonic acid gas, and the effects of which depend largely upon the sodium sulphate; of these springs the principal are Carlsbad, Marienbad, Sarotoga Hathorn Spring, Franzensbad and Tarasp.

For the earliest systematic investigations of the action of these waters in disorders of digestion we are under obligations to Jaworski,[2] whose researches were later supplemented by various other observers, notably Spitzer,[3] Ewald, and Sandberg.[4] The conclusions of these various investigators do not seem to agree. Thus, while Jaworski observed a decrease in the secretion of hydrochloric acid and pepsin after the use of Carlsbad waters, Ewald and Sandberg were unable to establish that these waters materially, if at all, decreased the amount of these substances in the gastric secretions. From an investigation of some eighteen cases Spitzer arrived at practically the same conclusions as Ewald and Sandberg. After four weeks' treatment at Carlsbad most of these cases showed an increase in the muscular power, and in none of them did a decrease in this function take place. The influence upon the secretion of hydrochloric acid was somewhat variable: in some instances it was increased and in others diminished; in cases of hyperacidity a rapid decline to the normal took place, but it did not go materially below.

The use of these waters at home, in the bottled form, may be resorted to, but it cannot be so successful as a sojourn at the springs, where the complete rest, the freedom from mental worry, the great care in diet, and the open-air life are all important aids in effecting a cure.

Hygienic conditions must be considered as tending to promote cure in cases of chronic gastritis. An abundance of exercise, especially out of doors, should be recommended; therefore bicycle and horseback exercise, as well as walking, may be resorted to with advantage. At home, when out-of-door exercise is impracticable, the swinging of clubs or the use of any of the exercising apparatus may

[1] Riegel: *Nothnagel's Spec. Path. u. Therap.*, Bd. xvi. Th. 2, S. 285.

[2] *Deutsches Archiv für klin. Med.*, Bd. xxxvii, und *Wiener med. Presse*, 1888, Nos. 3, 4.

[3] *Therapeutische Monatshefte*, April, 1894.

[4] *Klinik*, etc., Bd. ii. S. 243.

be substituted. Exercise should be carefully regulated, however, and care should be taken that it be not overdone. The condition of the skin should also be looked after, and a daily cold sponge-bath with brisk rubbing afterward with a Turkish towel will be found conducive to this end. In many instances advantage will be derived from change of air and occupation, and camping-out in the woods or a protracted sea-voyage may accomplish what the strictest regulation of the diet and the most carefully managed medication will fail to do.

Among the direct means of treating gastric catarrh, lavage, or the washing out of the stomach, will be found to be of the greatest benefit. Of all the remedies tending to increase the functional activity of the gastric secretory glands it gives the best results. Not only is secretion of hydrochloric acid and pepsin furthered by the use of lavage in this affection, but the mechanical effect of the procedure is also of the greatest benefit. No small part of the cure of this disease depends upon the removal of the thick, ropy mucus that clings to the gastric walls and mechanically impedes and interferes with the proper secretion of gastric juice. By the use of lavage this mucus is not only gotten rid of, but the nests of bacteria of various kinds which are imbedded in it, and which multiply with great rapidity, are also removed, and thus one of the most important factors in the production of fermentation is eradicated. The collection of such a mass of thick, tenacious mucus upon the gastric wall not only offers a mechanical obstruction to the pouring out of the gastric secretion, but it also interposes itself between the secretory glands and the food in the stomach. In this way the stimulating effect normally exerted upon the glands by the presence of food in the stomach is interfered with and the glandular secretion prevented.

Thus the good effects following the use of lavage are due to several conditions: the mucus with its contained bacteria is removed, and fermentative and putrefactive processes prevented; a mechanical interference with the secretion of gastric juice is gotten rid of; and the secretory and motor functions are directly stimulated. The mere presence of the water in the stomach and its impact against the gastric wall tend to increase the gastric flow, and especially is this the case when the water is forced in under pressure in the form of a douche. By this latter procedure vasomotor functions are stimulated, and by the increased activity of the circulation more blood is brought to the tissues. From these effects, unless the glandular structure is largely atrophic, the necessary sequence must be a healthy reaction. Degenerative changes are further arrested, and positive relief of the pathological conditions is brought about, by the effect of lavage upon the muscular coat of the stomach. My own experience confirms that of

others in that the effect of washing out of the stomach is to increase its tonus and to stimulate peristalsis. Under its influence, therefore, the food is more quickly advanced and its digestion hastened, thus preventing its long retention in the stomach and consequent fermentation with its tendency ultimately to produce gastrectasis.

Of the various contrivances for lavage that of Ewald is most universally employed. It consists of a piece of soft-rubber tubing about one yard in length, open at both ends, and possessing several fenestræ near the end introduced into the stomach. To the other end a large funnel of about two quarts capacity is attached. After the introduction of the tube into the stomach the funnel is placed in a wooden frame contrived for the purpose, and is then filled with the desired quantity of water. It is then elevated, the degree of elevation being regulated in accordance with the amount of pressure desired. From the various openings the water escapes with some force, and these several streams coming in contact with the wall of the stomach result in detaching the clinging mucus, and otherwise exert a beneficial effect. As soon as a feeling of distention and discomfort is experienced by the patient the further entrance of water should be stopped. This is accomplished by lowering the funnel and again placing it in the rest upon the floor, the funnel refilling from the stomach by siphonage. The wash-water may then be examined and its character determined. These manœuvres should be repeated until the returning water from the stomach is perfectly clean and free from mucus and particles of food.

Another very efficient contrivance is the Leube-Rosenthal apparatus, the use of which is strongly advocated by Einhorn,[1] and which consists of a large glass irrigator of capacity to hold two or more quarts. From this irrigator there leads a long piece of soft-rubber tubing which by means of a Y-shaped glass tube is connected both with the stomach-tube and with a second long piece of soft-rubber tubing, the latter placed in a vessel intended to receive the wash-water from the stomach. The tubing passing from the irrigator to the stomach-tube and the tubing passing from the stomach-tube to the wash-vessel are each provided with a clamp, so that by opening the clamp upon the former and closing that upon the latter the water passes into the stomach, while closing the former and opening the latter permits the wash-water to pass out of the stomach into the vessel provided for that purpose. Repeated washings should be resorted to at each sitting until the wash-water returns from the stomach free from mucus and particles of food. In order to facilitate the dislodgement of mucus from the walls of the stomach and to render its removal through the tube more ready of accomplish-

[1] *Twentieth Cent. Prac.*, vol. viii. p. 182.

ment, Einhorn advises that the patient shake himself while the water is passing into the stomach.

The same result may be obtained by following the suggestion made by Fleiner[1] that, after washing out the stomach while the patient is in the sitting position until the wash-water returns clear, the patient be allowed to lie down and the lavage further continued while in this position. As a result of this manœuvre it often happens that additional particles of food will be removed when previously the wash-water has returned perfectly clear.

In the early period of the treatment of a case of chronic gastritis lavage should be practised daily, while the stomach is presumably empty, and never, therefore, soon after the taking of a meal. For these reasons the operation is best performed in the morning before breakfast and again before retiring for the night. Of course such frequent lavage is necessary only in the severest forms of the disease, and in most cases a single daily lavage, before the first meal of the day, will prove quite sufficient. After the continuance of the treatment for ten days or two weeks the frequency of the lavage may usually be diminished, and the stomach then be washed out every other day. As the treatment progresses the frequency may be still further diminished, until finally it may be stopped altogether. While this is true of many cases, it is not true of those in which permanent and irremediable changes have taken place in the stomach-wall leading to gastrectasis. In this class of cases the daily lavage of the stomach becomes as much a part of the daily routine of the patient's life as his daily bath. Nor is its use to be regarded as a hardship, for these patients easily acquire the ability to themselves introduce the tube with facility and without inconvenience, while the alleviation of the distressing symptoms that it accomplishes more than compensates for any troublesome and disagreeable features attending its employment.

In the use of lavage care should be taken not to introduce too large a quantity of water into the stomach. It should be borne in mind that the tendency in all forms of chronic gastritis is toward atrophy of the stomach and gastrectasis. Therefore it seems to me an injurious procedure to introduce into a stomach with weakened walls, and already, perhaps, beginning to undergo dilatation, a large quantity of fluid that by its mere weight alone can only hasten the development of gastrectasis, or at least produce gastroptosis. It is by far too common a practice in such cases to keep pouring water into the stomach until the patient complains of some discomfort, a result sometimes not obtained until several quarts of water have been intro-

[1] *Volkmann's Sammlung klinischer Vorträge*, Neue Folge, 1894, No. 103. Referat. Riegel, *Nothnagel's Specielle Path. und Therap.*, Bd. xvi. Th. 2, S. 288.

duced. Such a method of conducting lavage can only tend to aggravate the condition that it was the object of the treatment to alleviate. It would appear more rational, therefore, in this class of cases to provide for the return of the water immediately after its introduction, or at least to retain a ready means of controlling the quantity in the stomach at any one time. This can be readily accomplished by means of the double tube, the water being forced into the stomach under pressure, that none of the mechanical effects of lavage shall be lost. According to my experience the combination of lavage and the gastric douche accomplished by thus forcing the water into the stomach under pressure, and through a tube provided at its end with a number of small openings, has been attended with marked success. The mucous membrane of the stomach is in this way given what is practically a needle douche, while through the return tube the mucus and particles of food pass out into the wash-vessel.

These numerous streams impinging with force upon the mucous membrane detach the mucus clinging to its surface more readily than will the ordinary method of lavage; and, what is of more importance, the effect upon the circulation cannot fail to be attended with good results. The vasomotor centres are stimulated, a better blood-supply seeks the stomach, and degenerative processes are more likely to be retarded or arrested. By this method, also, the muscular coat of the stomach must be stimulated to a greater degree than by lavage as ordinarily practised, so that peristaltic movements will be increased and the tendency to the prolonged retention of food within the stomach obviated.

In electricity we possess another important and oftentimes efficient means of treating chronic gastric catarrh, and we see frequently illustrated in practice the truth of Goldschmidt's[1] statement that the direct electrization of the stomach is not only an important means of combating the nervous disorders of the stomach, but is also of good service in those gastric affections possessing an organic basis.

While some doubt exists as to the manner in which electricity acts in gastric disorders, it is probable that its use in chronic gastritis promotes the secretion of the proper gastric juice as well as increases the activity of gastric peristalsis. The former result is accomplished by the action of the electrical current upon the gastric secretory glands through its effect upon the innervation of the organ, while the latter is brought about by the effect of the current upon the muscular coat. Thus we have relieved many of the symptoms of the disease which are dependent upon diminution or absence of hydrochloric acid, and by the stimulation of the glands to renewed activity further degenerative processes are retarded or prevented.

[1] Riegel, *Nothnagel's Specielle Path. u. Therap.*, Bd. xvi. Th. 2, S. 306.

The effect of the current upon the muscularis, and the resulting increased activity of peristalsis, can but add to the tonicity of this structure, thus preventing the too long retention of food within the stomach and preventing the development of gastrectasis to which many cases of chronic gastric catarrh tend. That the electric current thus brings about its favorable results in chronic gastritis is a mere conjecture which, whether true or not, matters little as regards the practical results; for, as Einhorn remarks in this connection, "The chief factor in determining the efficacy of any means of treatment is, and always will be, experience."

There now remains but little doubt as to the comparative value of direct gastric electrization over the introduction of the electrical current through the tissues of the abdomen, the so-called percutaneous method. By the latter method the current must be so diffused in its passage through the abdominal wall that it is doubtful if any portion of its effects arrive at the stomach, or at least these effects must be then so attenuated that but little good will result. Nevertheless, that some good follows the use of the percutaneous method has been demonstrated by many observers, and its employment in preference to direct electrization has been especially advocated by Von Ziemssen,[1] in whose opinion the results obtained by the latter method are not sufficiently great to justify the straining and exhaustion attending the introduction of the electrode into the stomach. The same observer further contends that intragastric electrization is insufficient because, owing to the left direction of the axis of the œsophagus, the electrode in its introduction is deviated in this direction and hence invariably comes in contact only with this portion of the greater curvature, and that as a result the organ is influenced only in part and not in its entirety.[2] It has, however, been sufficiently demonstrated that the introduction of the electrode into the stomach after the viscus has been partially filled with water results in the uniform transmission of the current in different directions, and that all that portion of the organ below the level of the water will be influenced. If for any reason, however, in any individual case direct gastric electrization be deemed inadmissible or inadvisable we may substitute for it the percutaneous method with the expectation of obtaining at least a considerable degree of benefit. In this procedure one electrode is placed upon the epigastrium while the other is placed upon the back near the fifth or sixth dorsal vertebra, and to the left of the vertebral column.

With the introduction of new methods in direct electrization the principal objections to the procedure have disappeared. With the older technique it was necessary for the patient to retain the stomach-

[1] Riegel, *Nothnagel's Specielle Path. u. Therap.*, Bd. xvi. Th. 2, S. 308.
[2] *Klinische Vorträge*, 1888, No. 12.

tube, through which passed the wire to the electrode, within the stomach throughout the entire séance. The effect of this prolonged retention of a thick tube in the œsophagus was to produce a great deal of gagging and straining, followed by more or less exhaustion, and for these reasons the intragastric applications of electricity met with much adverse criticism.

That internal or direct gastric electrization has been brought within the range of practical therapeutics is undoubtedly due chiefly to the experiments of Einhorn, and his invention of the device named by him the deglutable stomach-electrode. This instrument consists of an electrode about the size and shape of an almond, the component parts of which are a hard-rubber capsule possessing multiple openings and, within the capsule, a metallic button connected with a thin wire which serves as a means of communication with the battery; the wire passes through a very fine rubber tubing. The object of the hard-rubber capsule is to prevent the metallic button from coming into direct contact with the stomach, while the multiple openings in the capsule permit contact between the metallic button and the water within the stomach, and through this medium the circuit is completed.

Ewald[1] has modified the apparatus of Einhorn to the extent of running the thin wire connecting with the electrode through rubber tubing of greater thickness than that previously advocated. This, he considers, renders the instrument more ready of introduction in those persons who find the swallowing of the capsule difficult, or in whom the capsule has a tendency to lodge in the œsophagus. The size of this tubing corresponds to Carrière No. 13, and the thickness of its walls is about one and a half millimetres. With this tubing the operator is able to introduce the electrode in very much the same manner used in the introduction of the ordinary stomach-tube, and is not obliged to depend entirely upon the ability or willingness of the patient to swallow it.

Before the application of direct electrization the patient should be properly prepared, and for this all that is necessary is that he should take, upon an empty stomach, one or two glasses of water. The electrode is then introduced by passing the capsule as far back as possible upon the tongue, and the patient is then told to swallow, the deglutition of the instrument being facilitated by the patient again drinking some water. As soon as the electrode is within the stomach, a fact readily ascertained by placing a mark upon the rubber tubing at the proper point, the electricity may be applied.

The technique of the procedure is, perhaps, best explained by the following quotation from Einhorn:[2]

[1] *Klinik der Verdauungskrankh.*, Dritte Aufl., Bd. ii. S. 95.

[2] *Twentieth Century Practice*, vol. viii. p. 191.

"The patient, when the deglutable electrode is within the stomach, opens his clothes, so that the abdomen is accessible. The key of the deglutable electrode is connected with the cord (negative pole) running to the battery.

"*Gastro-faradization.*—Sitting, ten minutes; at first the large plate electrode at the gastric and epigastric region for five minutes, then a small ordinary sponge electrode. The electrode is at first moved up and down from left to right in the gastric region; sometimes, especially when there is constipation, the electrode is passed over the region of the colon—ascendens, transversum, and descendens—always beginning in the right iliac region and stopping at the left iliac region (duration, two minutes); we then proceed from the gastric region from right to left to the back, and remain at the left side of the seventh dorsal vertebra for one minute. At this place the current can be applied quite strongly, and most patients then experience a slight sensation within the stomach: the patients find it difficult to describe this sensation; some assert that they experience a dragging feeling, others a feeling of weight, and others again a feeling of pinching. All of them refer the feeling to the stomach, and locate it opposite different heights of the abdominal wall. We then return to the front, moving the electrode gently up and down over the gastric region for two minutes, gradually decreasing the current, and thus end the sitting. The current must be of such a strength that it causes distinct contractions of the abdominal walls, but it is not well to have it so strong that the patient experiences pain.

"*Gastro-galvanization.*—Negative pole within the stomach; small sponge electrode. Duration, eight minutes. First, for two minutes below the ensiform process (during first minute the current is gradually increased to its necessary strength), then for three minutes moving the electrode up and down the gastric region. After this we go to the back and remain one minute at the left side of the seventh dorsal vertebra, return to the front, move the electrode around the gastric region for one minute, and then remain quietly for one minute below the ensiform process. During this time the current is gradually weakened and the sitting is ended. The strength of current is ordinarily fifteen to twenty milliampères.

"In withdrawing the electrode a resistance is felt at the introitus œsophagi; it is not advisable to pull the electrode with force. One has only to make the patient swallow once or twice, and to make use of the moment when the larynx, by this act, ascends and the passage becomes free to withdraw the electrode, which is now done with perfect ease."

In chronic gastric catarrh direct gastro-faradization should be used in preference to the application of the galvanic current, for the reason

that its effects are to stimulate the secretory functions of the stomach and hence increase the output of hydrochloric acid. The good results obtained from the galvanic current are seen especially in the gastric neuroses, and particularly in those forms characterized by pain. The usefulness of this current in chronic gastritis, therefore, finds its best expression in those cases characterized by sensory disturbances, especially the severe gastralgias sometimes attending the affection. This difference in the effects of the two currents is especially insisted upon by Goldschmidt, who recommends the employment of intragastric galvanization (positive pole in the stomach) more for the painful affections of the stomach, while he restricts the use of the faradic current to those conditions of the stomach characterized by a disturbance of its function.

The electrical treatment of the stomach in chronic gastritis should be conducted frequently. During the earlier part of the treatment the sittings should be every other day, and should thus continue for three or four weeks; or the frequency of administration may be earlier diminished if there be a marked amelioration of the symptoms. The number of sittings may then be reduced to two weekly, and then to one weekly, and should be continued for some time after the disappearance of the symptoms.

While electricity affords us a valuable means of treating this at times very troublesome disease, there are those whose conclusions are entitled to earnest consideration who consider it inferior to other means at our command. Rosenheim, in particular, has not observed the favorable result so ardently claimed for electricity in the secretory diseases of the stomach, and believes that more can be accomplished by medication supplemented by lavage, or even by medication alone.

In considering the use of drugs in chronic gastric catarrh, our thoughts naturally turn first to hydrochloric acid. The use of hydrochloric acid in this disease is of course suggested by the character of the anatomical changes that occur, and the absence or diminution of the quantity of hydrochloric acid in the gastric secretions dependent upon these anatomical changes. Therefore, by the administration of this drug we endeavor to replace an important constituent of the gastric juice temporarily or permanently absent from it. It is important to bear in mind, however, that not every case showing a diminution of the normal quantity of free hydrochloric acid calls for its artificial replacement, as in many instances the diminution or even entire absence of hydrochloric acid will be found to depend upon the simple abeyance of the secretory functions of the stomach, and not upon advanced atrophic changes in the secreting structures. In cases of this character the indication is to stimulate the functions of the

stomach that for the time being are inactive rather than to artificially administer a substitute. The secretion from the gastric glands is rendered more efficient under the influence of a proper stimulus, and if, instead of so stimulating the function of the glands, a drug such as hydrochloric acid be administered, the demand made upon the secretory structures is lessened, and the activity with which their function is performed will be diminished. In this way we would defeat our ultimate object, as the maintenance of a proper degree of health of a tissue depends upon continued activity, while inactivity leads to atrophy and loss of function. Therefore, in this class of cases, better results are often obtained by resort to the mechanical means of treating the stomach, especially lavage and electrization, and by the administration of that class of remedies generally called the stomachics.

In those instances of chronic gastritis in which hydrochloric acid is persistently absent or markedly diminished in amount, and in which these changes are dependent upon advanced structural lesions, the administration of hydrochloric acid becomes of the utmost value. By its action stomach-digestion is materially aided and the administration of albuminous articles of diet rendered permissible, while its use is further indicated on account of its disinfectant and anti-fermentative properties. When hydrochloric acid is absent fermentation and decomposion of the gastric contents readily takes place, especially as then gastric digestion is much delayed and the food is retained for an undue length of time. In these cases the dose of the drug should be a large one—20 to 30 drops, well diluted—as it is difficult to conceive of much benefit arising from the ordinarily prescribed dose of 10 drops when we consider the degree of dilution it undergoes when mixed with the contents of the stomach, and if we further reflect that some forms of fermentation are not seriously interfered with by small amounts of hydrochloric acid. While hydrochloric acid is valuable for its anti-fermentative properties, it must not be forgotten that in lavage we possess a much more efficient and more certain means of combating this condition.

Riegel[1] also ascribes to hydrochloric acid the properties of a stomachic, at the same time stating that the manner in which it acts is not well understood. He advises, in order to obtain the stomachic effects of the drug, that it be administered about a quarter of an hour before meals instead of afterward, and in small doses rather than the large doses prescribed under other circumstances; and further states that, administered in this way, it is not uncommon to find the appetite increase and the ability of the patient to take more nourishment enhanced.

[1] *Nothnagel's Specielle Path. und Therap.*, Bd. xvi. Th. 2, S. 260.

Hydrochloric acid is best administered in the form of the diluted acid usually employed. It should be given after meals in doses of from 15 to 20 drops, or more, largely diluted with water, care being taken to protect the teeth by the taking of the medicament through a glass tube. It is perhaps better not to take the entire dose at one time, but rather to divide it into three or four portions to be taken at intervals of about half an hour. In my experience the very large doses advocated by Ewald and others have proven unnecessary, and a dose of 20 drops taken three times daily in accordance with the method described should be regarded as the maximum amount required.

The digestive ferments, and in particular pepsin, were, until a recent period, largely employed in the treatment of digestive disorders, and especially in the management of chronic gastric catarrh, in which affection this ingredient is so frequently lacking from the gastric secretions. Even in those instances in which hydrochloric acid is totally lacking, and which therefore show also an absence of pepsin, there still will be present in the gastric secretions, in the vast majority of such cases, the zymogen of pepsin, or pepsinogen, from which with the administration of hydrochloric acid pepsin will be produced in abundance. The cases of chronic gastritis in which pepsinogen is absent from the gastric secretions are of very infrequent occurrence, and even in this class of cases the inutility of pepsin must be admitted when we consider the disproportion between the digestive powers of the pepsin ordinarily sold and the pepsin of the normal gastric secretion.

What is true of pepsin is also true even to a greater extent of the other digestive ferments, such as papain and pancreatin, so largely and indiscriminately employed in the treatment of disorders of digestion. It is true that when our knowledge of diseases of the stomach lacked the precision that at the present day it has attained, the use of these medicaments seemed, upon theoretical grounds at least, to be indicated. Since closer observation and the more scientific consideration of the subject have proven the facts just mentioned, it seems to me that the use of the digestive ferments, at least in chronic gastric catarrh, can be abandoned with advantage, and that our efforts should be directed toward the stimulation of the secretory functions of the stomach, particularly by the physical means at our disposal.

For a long time past practical experience has demonstrated the value of the so-called bitter tonics, or stomachics, in the treatment of disorders of digestion, although the manner in which they act is still somewhat of an open question. It is claimed for some of these remedies that they directly stimulate the secretion of the gastric juice, and for others that their powers to aid digestion depend largely upon their ability to increase the motor power of the stomach, and that they thus

lessen the period during which the food remains within the stomach, where the digestive function is feeble. That this class of remedies increases the appetite is a well-known fact.

We are under many obligations to Reichmann[1] for a very careful investigation of the mode of action of the bitter tonics. These researches are of more value in that they were conducted upon patients suffering from disorders of digestion rather than upon animals, as were many of the previous investigations. The results in some of the latter seemed to prove that, so far from the secretion of hydrochloric acid being stimulated after the administration of the bitters, their exhibition was actually followed by its lessening. Reichmann chose for his experiments the two groups of bitter stomachics, the simple bitters and the aromatic bitters, but no great difference in the action of the different members of the two classes of drugs could be established. He found that there follows *immediately* after the introduction of a bitter infusion into the fasting stomach less secretory activity than followed the administration of distilled water, but that after the passage of the bitter from the stomach a notable increase in the amount of hydrochloric acid occurred. The bitters appear to have no effect in stimulating the secretion of hydrochloric acid, or in increasing the digestive functions of the stomach, in those cases in which the gastric secretion is normal or nearly so. In cases, however, in which hydrochloric acid is diminished in amount or is absent altogether, provided this absence is due to a simple abeyance of function, its increase follows the use of the bitters. Of course in those cases of chronic gastric catarrh in which the pathological changes have proceeded to more or less complete atrophy and destruction of the glandular structure of the stomach, the use of the bitters is not indicated, as no secretory structure remains to be stimulated.

The bitter tonics, therefore, are to be prescribed only in those cases in which the activity of the secretory glands is diminished; and, for the reason that no increase in the amount of hydrochloric acid takes place until after the disappearance of the remedy from the stomach, they must be taken about half an hour before meals.

Of course the results derived from the use of the bitter tonics, as from all measures calculated to stimulate the gastric secretions, will depend greatly upon the intensity of the gastric inflammation and the extent to which the glandular structure is capable of giving a response; and it seems to me that this fact explains somewhat the differences of opinion as to whether the bitters act favorably by increasing gastric secretion or simply by their influence upon the muscular tone. In those cases in which digestion is retarded or rendered difficult by

[1] *Zeitsch. für klin. Medicin*, Bd. xiv.; referred to by Riegel in *Nothnagel's Path. u. Therap.*, Bd. xvi. Th. 2, S. 270.

weakened muscular activity much benefit is to be derived from the use of nux vomica or strychnine, its alkaloid, which has long been considered as possessing especial effects upon the muscular tone as well as upon the glandular activity. Of the various bitters it is my experience that the greatest benefit is to be derived from nux vomica or strychnine, and especially in those cases of gastritis of alcoholic origin. Next in efficiency I would place condurango, gentian, and quassia, although the remaining members of the group of stomachics, such as calumba, kino, chamomile, cardamom, ipecac, etc., are each of value, and one scarcely knows what influences him in choosing one rather than the other in a given case. These drugs may be given alone, but it is more usual to give several of them in combination, and such combinations as nux vomica with gentian, or with condurango and belladonna, seem to be more efficacious than the administration of the single drug.

The management of some special symptoms requires a brief mention. One of the most persistent and, at times, troublesome conditions associated with chronic gastric catarrh is constipation. In cases where the condition of the stomach will permit of it, a regulation of the diet with special consideration as to the condition of the intestines will be found of value. Therefore the use of foods containing a large proportion of residue, increasing the quantity of the intestinal contents and thereby stimulating the peristaltic movement, will be found in many cases all that is required for the relief of constipation. So also the use of fruits, fresh or stewed, prove simple and often efficacious means of overcoming this condition.

Enemata and laxative suppositories, such as those of glycerin, may be resorted to, especially in cases in which want of tone of the large bowel exists and in which hardened fæcal masses tend to accumulate in the descending portion; these measures tend to increase the muscular activity and to soften the retained fæces and render them easy of evacuation.

Among drugs, we find benefit derived from rhubarb, senna, taraxacum, occasionally mercury in small doses, aloes, podophyllin, jalap, colocynth, and cascara sagrada. Certain of the aperient mineral waters may also be used with advantage, and in some cases, where action upon the small intestines is desired, good results are obtained by resort to the saline cathartics.

To all measures for the relief of constipation the patient is only too apt to become habituated, a tolerance being thus established. No such means of relief, therefore, should be too long continued, and drugs should not be resorted to if it be possible to alleviate the condition by the more simple methods described.

So much has been said about the anti-fermentative action of hydro-

chloric acid and the effect of lavage in removing the products of fermentation that further consideration of the symptoms arising from fermentation and decomposition of the food in the stomach seems hardly called for. Nevertheless, in some cases lavage is impossible, and then other measures must be resorted to. For the relief of the condition in many cases a careful regulation of the diet is all that will be found necessary, and, indeed, in all cases presenting this condition the regulation of the diet constitutes an important preliminary to the administration of drugs, for when the stomach contains a large mass of fermenting and decomposing material it becomes impossible to counteract these changes without giving drugs in such doses that their tolerance by the stomach is impossible. Thus, reducing the possibility of fermentation to a minimum, we may obtain excellent results from various anti-fermentative and antiseptic remedies. Among these may be mentioned resorcin, carbolic acid, bismuth salicylate, naphthalin, beta-naphthol, etc. The best among this class of remedies, however, will be found to be thymol and creasote, and the latter will be found to be especially valuable in the chronic gastric catarrh of phthisis. These remedies may be administered one or two hours after eating, and the dose may be repeated in one or two hours, should a single dose prove insufficient to accomplish the purpose intended. In some instances fermentative symptoms are relieved by the use of antacids, especially bicarbonate of soda, administered alone or preferably in combination with bismuth. As pointed out by Ewald, however, the effect of the alkalies in this condition is one of palliation, and by their use the cause upon which the process depends is favored rather than opposed.

Gastralgia is a symptom at times requiring treatment in the course of chronic gastric catarrh. As already pointed out, this symptom in many instances may be promptly relieved by gastro-galvanization with the positive pole (Goldschmidt) within the stomach and a small sponge electrode upon the epigastrium. It must also be remembered that many of the measures already mentioned in the treatment of the disease itself will exert a beneficial action upon this symptom should it be present; particularly is this true of lavage and the gastric douche. Among drugs I have obtained the best results from cannabis indica, sulphate of codeine, and nux vomica, especially when given in combination. I am in the habit of prescribing them in pill form, as follows:

℞. Codeinæ sulphat., gr. iij (0.18);
Ext. cannab. indic., gr. ij (0.12);
Ext. nucis vom., gr. iij (0.18).
M. et ft. pil. No. xii.
Sig. One pill to be taken three times daily after meals.

Belladonna, hyoscine, hydrocyanic acid, Hoffman's anodyne, and spirit of chloroform may also be used for the relief of this symptom. When gastralgia is resistant, however, recourse must be had to the hypodermic use of morphine for its palliation. In a chronic disease of this character, the danger of thus establishing the opium-habit must be pointed out.

Vomiting is a symptom that is best treated by lavage. It is not frequently that it demands special attention.

In the brief discussion of the etiology of chronic gastritis it was pointed out that many cases were of secondary origin, depending upon diseases of other organs, or upon some general constitutional conditions. Under these circumstances the primary necessity of relieving this condition before the gastric changes can be effected becomes apparent. Thus in hepatic cirrhosis, chronic cardiac and pulmonary diseases, and renal disease, the primary cause of the changes within the stomach must be eradicated before relief of the gastric symptoms can be hoped for. The same may be said of the chronic gastritis accompanying chlorosis and other forms of anæmia, and I have repeatedly seen marked improvement follow the administration of iron and other blood-making remedies when previous treatment of the case upon a pure gastric basis had failed.

DILATATION OF THE STOMACH, OR GASTRECTASIS.

As to what constitutes a pathologically enlarged stomach cannot always be determined by an estimation of the capacity of the organ, as wide variations in the size are found to occur in individuals who give no evidence of gastric disorder. Of the stomachs examined post-mortem by Von Ziemssen, taken from individuals of about the same size with a view of determining a standard for the capacity of the organ in health, the largest was found to hold 1680 c.cm., while the smallest would hold but 250 c.cm. More recent investigations conducted by Pepper and Stengel[1] would show that even greater enlargement may exist and symptoms of gastrectasis be absent; thus the largest stomach of the series examined by these observers gave a capacity of 2600 c.cm.

In none of the individuals from whom these stomachs were taken had there been any digestive disturbances complained of during life. From its capacity alone, therefore, a stomach cannot be said to be pathologically dilated unless such capacity be in excess of 1700 c.cm. On the other hand, it can be readily understood that a stomach the

[1] *American Journal of the Medical Sciences*, Jan., 1897.

normal capacity of which is approximately 250 c.cm. might in reality be very greatly dilated by some pathological condition, even though in capacity it did not approach the limit mentioned above. We must learn to depend, therefore, more upon the symptoms to determine the existence of ectasia ventriculi, or at least associate these symptoms with the evidences of increased capacity. To that condition in which the stomach is enlarged but in which no symptoms of dilatation are present, Ewald has given the name megastria; while the term gastrectasis is restricted to those cases presenting not only the physical signs of dilatation, but also the symptomatic evidences of functional insufficiency. Fortunately these symptoms are distinctive and leave the diagnosis in but little doubt.

Dilatation of the stomach occurs either as a result of changes primarily affecting the gastric walls, or else as the result of a mechanical obstruction at the pylorus to the passage of the stomach-contents into the intestines. Dilatation due to the first group of causes in certain rare instances develops acutely and is then dependent upon rapid overfilling of the viscus. This form is sometimes seen after eating and drinking contests, and fatal results have been recorded. Repeated and habitual overfilling of the stomach, however, may give rise to dilatation of the chronic variety, producing atony of the muscular coat by subjecting it to excessive demands. On the other hand, chronic dilatation of the stomach occurs from atony of the gastric walls incident to the chronic degenerative changes accompanying chronic inflammatory diseases of the stomach. It has already been pointed out how in chronic gastritis the tendency of the affection is toward complete atrophy of the secretory structures of the stomach, and how, from the consequent diminution or absence of the proper gastric secretions, digestion is delayed and the food retained for an undue length of time within the stomach. It has been further pointed out that in chronic gastritis the motor power of the stomach is lessened and peristaltic movements enfeebled; and that this, added to the alteration in the secretions, tends still further to postpone the period when the gastric contents are passed into the intestines. This prolonged retention of food within the stomach, with the resulting fermentative processes and overdistention of the organ by the gases evolved, tends to mechanically interfere with the nutrition of the gastric walls and to promote their insufficiency. If these conditions could arise in a perfectly healthy organ its dilatation would probably take place; how much more, then, is it likely to occur when the gastric walls are atonic and atrophic as in chronic gastric catarrh!

Insufficiency of the muscular power of the stomach, either relative or absolute, may arise in conditions of general asthenia, the gastric muscularis in these instances simply sharing in the general atony of

the muscular system at large. In this way can be explained the gastrectasis accompanying cachectic states such as cancer, profound anæmia, diabetes, Bright's disease, tuberculosis, etc. The stomach shares in the general malnutrition, its muscular power is lessened, gastric digestion is retarded, fermentation results, and as the result of the consequent overdistention dilatation develops. If, with a stomach the nutrition of which is thus impaired, the patient suffers from an abnormal appetite—as, for instance, in diabetes—it can be readily understood how aggravated the condition may become.

As Ewald has pointed out, gastrectasis may result from the weakening of the expulsive powers of the stomach by the "exclusion of a more or less sharply bounded portion of the muscular fibres of the stomach." This may be brought about by the destruction of a portion of the gastric muscle due to cancerous growth or extensive ulceration, so that complete gastrectasis occurs, or, at least there takes place a dilatation of that part of the stomach behind the obstruction offered to peristalsis by the areas in which the muscle-fibres have been destroyed.

Dilatation of the stomach is also said to occur as the result of lessening of the excitability of the nervous mechanism governing peristalsis, or paresis of the nerve-fibres presiding over the motor functions of the stomach. These conditions, as a rule, depend upon some reflex inhibitory influence, or are due to the effects of the local lesions of the stomach already dwelt upon.

The greatest degree of gastrectasis is to be found in those cases dependent upon a mechanical obstruction at the pylorus. This at once disturbs the relationship existing between the normal muscular activity and the amount of resistance normally offered by the pylorus. Consequently undue demands are made upon the muscularis, to meet which hypertrophy of the muscular coat at first takes place. As the degree of the obstruction increases, however, and develops in excess of the ability of the gastric muscle to overcome it, stretching of the stomach-walls takes place, the individual muscle-fibres become separated, and gastrectasis occurs. The most common cause of pyloric obstruction is undoubtedly carcinoma, the pylorus being the most frequent location of gastric cancer. Another cause of common occurrence is to be found in the cicatricial contraction following the healing of an ulcer in the immediate neighborhood of the pylorus. Under these circumstances it is not necessary for the cicatrix to directly involve the pylorus, as obstruction of the orifice may be brought about by the inflammatory infiltration of the tissues in the vicinity of the cicatrix. Again, obstruction may be caused by a pedunculated polypus, carcinomatous or not, springing from the stomach-wall near the pylorus and dropping down into the pyloric orifice and producing obstruction

very much as would a ball-valve. This, however, must be considered as one of the rarer causes of pyloric obstruction. Congenital stenosis of the pylorus also occurs, and may be classed among the rarer causes of gastrectasis. Stenosis of the pylorus may also be brought about by pressure from without the stomach or by its involvement in the growth of neoplasms arising in the viscera adjacent to it. Thus from tumors of the pancreas, the liver, or the gall-bladder, of the retro-peritoneal glands, or the omentum, pressure may be exerted upon the pylorus occluding the outlet. The same condition is said to result from a displaced right kidney, but, as is insisted upon by Ewald, the kidney must have become fixed in its abnormal position in order that it may interfere with the passage of chyme through the pylorus. If a kidney be a wandering one its mobility is implied, a fact that would prevent it from exerting an occluding pressure upon the pylorus sufficiently prolonged to induce dilatation.

Gastrectasis dependent upon pyloric obstruction can only in the beginning be considered as due to purely mechanical conditions. It can be regarded, for instance, as only in part analogous to the dilatation of the left ventricle of the heart following aortic stenosis, because as soon as the pyloric stenosis persists for a sufficient length of time to give rise to any degree of gastrectasis the gastric contents are delayed in their passage into the intestines and fermentative processes take place. There therefore develop, in addition to the pyloric stenosis, other conditions which in themselves are no less important in the etiology of the affection.

Treatment.

The treatment of dilatation of the stomach should be directed toward checking the development of fermentative processes within the stomach, and preventing the retardation of the gastric contents by compelling them, if possible, to pass downward into the intestines. When this cannot be accomplished the withdrawal of the fermenting stomach-contents by the stomach-tube becomes necessary. In addition, the diet must be carefully selected, while gastric digestion should be assisted as much as possible, and even at times replaced or supplemented by rectal alimentation.

To prevent fermentative processes developing in the gastric contents, various antiseptic and anti-fermentative remedies have been suggested. Among them may be mentioned salicylic acid in doses of from 5 to 10 grains, or the salicylate of bismuth in somewhat larger doses. Carbolic acid in minim doses, or creasote in doses of from 1 to 5 minims may be given several times during the course of the day. In hydrochloric acid we possess one of the very best anti-fermentatives, and it may be taken in large doses, well diluted, at frequent intervals

during the day. Of all the means at our disposal, however, for arresting or preventing fermentation of the gastric contents, none compare in efficacy with lavage. By this procedure we prevent the undue retention of the food within the stomach and thus remove the condition upon which the fermentative processes primarily depend. It is in the treatment of gastrectasis that the most satisfactory results are obtained from lavage in gastric therapy. The frequency of the operation should be regulated in accordance with the requirements of each individual case; in many instances lavage twice daily will be found necessary, and then the times chosen should be the evening before retiring and the morning before the first meal. If the case require more frequent washing out, care must be taken to allow for all the time possible during which digestion of the food is likely to take place. This precaution must be exercised in any case, so that from five to seven hours should be allowed to elapse after eating before the stomach is washed out. The lavage should be continued until the wash-water returns perfectly clear, and especially is free from lumps of food or masses of mucus. As already pointed out in the consideration of lavage in the treatment of chronic gastric catarrh, by causing the patient to change from the sitting to the recumbent posture during lavage fresh surfaces of the gastric wall are brought under the influence of the irrigation, and masses of food and mucus removed that could not be reached without this variation of the usual method. At the conclusion of the lavage many cases are benefited by irrigation of the stomach by some anti-fermentative solution. Thus Einhorn recommends the spraying of the stomach with a 1 : 3000 solution of nitrate of silver; or for this purpose may be used with advantage a 3 per cent. solution of salicylic acid, or a weak solution of potassium permanganate, resorcin, naphthalin, or a 2 per cent. solution of borax.

In gastrectasis, or when a tendency to the condition exists, lavage should be carried out with great care. It must be borne in mind that one of the most important causes of the condition is the prolonged retention and the accumulation of food within the stomach; by mere force of pressure these do much to bring about dilatation. It seems to me irrational, therefore, that in the treatment of this disease by lavage we should pour into the stomach large quantities of fluid at one time, usually being guided before the withdrawal of the wash-water by the statement of the patient that the stomach is distended to its utmost capacity. This I have frequently witnessed, and I cannot but believe that the overdistention of a stomach already greatly atonic, and its subjection to the weight of such a large body of water as is often required to fill it, must result in an aggravation of the condition we seek to relieve. Particularly is this of importance in those cases where gastroptosis exists in association with gastrectasis. I believe,

therefore, that in these conditions better results are obtained by allowing only small quantities of water to pass into the stomach at a time; or, better still, that the irrigation of the stomach should be performed with a double tube in order that the wash-water should be returned as rapidly as it is passed into the stomach, so that the quantity allowed to remain in the stomach at one time may be readily regulated. This can be done and the advantage of lavage not be lost, if the end of the stomach-tube be provided with a number of small openings and the water forced in under pressure. This produces what is practically a needle douche, and these multiple fine streams impinging with force against the gastric mucous membrane effect the more ready removal of the mucus and particles of food clinging to it than does the ordinary method of lavage; as soon as dislodged these substances find their way out through the return tube. With the tube still in place the stomach may be irrigated with the selected antiseptic solution.

The effect of lavage in relieving the obstinate constipation which is present in many cases of gastric dilatation is a circumstance that has been noticed by many observers (Ewald, Kussmaul) and I have had frequent opportunities of attesting its value in this particular. Lavage is of the utmost importance as a remedial agent in the treatment of gastrectasis; in many instances an actual cure may result from its use, although, unfortunately, in a large group of cases, particularly those dependent upon a true stenosis of the pylorus, the results are but palliative. Even in this group of cases, however, the relief afforded to the distressing symptoms is a striking one.

Massage of the stomach acts beneficially in some cases by forcing the gastric contents into the intestines. It is obvious, however, that this can be regarded only as a procedure supplementary to lavage, and it is attended by the possible ill effects of driving into the intestine substances that cause irritation of its mucosa because they are too highly acid to be neutralized by the intestinal secretions. The method is applicable only to those cases of dilatation arising from benign stenosis of the pylorus, and to those cases due to causes other than pyloric obstruction.

Gastro-faradization, both by the intragastric and the percutaneous methods, has proven of advantage in the treatment of this condition. Particularly is this true of the former, although the application of this agent should be restricted to those cases of dilatation that are due to atony of the muscular coat of the stomach, with its consequent relaxation; it is of but doubtful advantage in those cases dependent upon stenosis of the pylorus. The direct application of the faradic current to the stomach stimulates the muscular coat to renewed activity and hastens the expulsion of food into the intestines, thus attain-

ing the object at which all our efforts are aimed in the treatment of this troublesome disorder.

The use of drugs, other than for special indications, is somewhat limited in the management of dilatation of the stomach. In cases attended by marked atony of the muscular coat the use of strychnine, or nux vomica, continued over a long period of time, has given beneficial results. When severe pain or gastralgia is of frequent occurrence much benefit may be derived from the intragastric administration of the galvanic current in the manner already described. Or for this symptom sedative remedies may be resorted to, such as cannabis indica, chloral, cocaine, and morphine; good results are also said to be obtained by the use of bismuth in large doses suspended in water. When hyperacidity exists the administration of alkalies is called for.

Constipation is a symptom requiring attention, and for its relief saline and other active cathartics may be resorted to. The use of this class of remedies is not only of benefit as affording relief from this symptom, but it has been shown that their action is to excite gastric peristalsis and thus hasten the evacuation of the stomach-contents. Again, the tendency to constipation may be relieved by the employment of enemata; large rectal injections of water possess the additional advantage of allaying the excessive thirst which is often such a troublesome symptom, and, by supplying the tissues with the fluids which the dilated condition of the stomach renders slow of absorption, they increase the amount of urine voided; this excretion is often markedly diminished in gastrectasis.

The importance of a properly regulated diet cannot be overestimated. The quantity of food allowed should be as limited as practicable, and fluids of all kinds are in general to be entirely cut off, or given in very small amounts. All foods that readily undergo fermentative changes are obviously to be avoided. It is evident, therefore, that all starchy foods and articles of diet containing sugar are to be proscribed; fatty substances, also, which when unduly retained within the stomach undergo decomposition, are not to be partaken of. The nourishment allowed a case of gastric dilatation should consist of foods chiefly of an albuminous nature, given in the most concentrated form possible. The various preparations of peptonoids now so largely manufactured, and some of which are so valuable as nutrients, will be found serviceable in this condition. So also meat-juices, meat-powders, peptonized milk, and articles of a like nature constitute the class of nourishment upon which reliance must be placed. As the amount of food given at any one time must be strictly limited it is evident that the frequency of its administration must be adequate to the demands of the tissues. In many cases gastric alimentation must for a time cease altogether, or be reduced to a

minimum; in these cases the resort to rectal feeding becomes necessary; and in any event much advantage is obtained by supplementing the gastric assimilation by nutrient rectal enemata.

CANCER OF THE STOMACH.

THE relative frequency of gastric cancer, as compared with cancer attacking other portions of the body, would seem to be conclusively demonstrated by the statistics collated by Welch from various sources and embracing the enormous number of 31,482 cases. These statistics show that cancer of the stomach occurs next in frequency to cancer of the uterus, the most common of all locations of cancer; the stomach being involved in 21.4 per cent. and the uterus in 29.5 per cent. of the cases. On the other hand the statistics of Virchow, embracing the cancerous affections occurring in Würzburg between the years 1852 and 1855, show that the stomach was involved in 34.9 per cent. of the cases, while in only 19 per cent. was the uterus attacked. Welch's cases, however, include Virchow's statistics, and the higher percentage which the latter show in favor of the stomach is counterbalanced by other series of cases in which the proportion with which these two organs are involved is practically reversed. It is only by the analysis of such a large series of cases as that brought together by Welch that conclusions which are approximately definite may be reached, as comparatively small series of cases may show with varying frequency the involvement of one or other of these organs in excess of the other.

While a common disease in this country, statistics would seem to prove that gastric cancer is rather more prevalent in Europe. Thus the statistics of New York City from 1868 to 1882 inclusive, as analyzed by Welch, show that the ratio borne by cancer of the stomach to all causes of death, at all ages, is about 0.4 per cent.; and even if only the deaths from upward of twenty years of age be taken, the ratio does not exceed 1 per cent. On the other hand the statistics of Halbertin, taken from all parts of Switzerland, show the death-rate from gastric cancer to be nearly 1.9 per cent., varying from 3 per cent. in the northern to 1 per cent. in the southern part.

The part played by sex in the predisposition to gastric cancer would seem to show, according to the statistics, that more males than females are affected. The statistics of Welch show that the ratio of males to females is about 5 to 4; or, in other words, of the 2214 cases subjected to analysis from this standpoint, 1233 occurred in males and 981 in females. In Brinton's collection of 784 cases, 440 were in

males and 344 in females. From a small series of 46 cases that I have taken from the records of the Jefferson Medical College Hospital, it was found that 36 occurred in males and 10 in females. While the above figures show a greater liability of the male sex to gastric cancer, it must not be overlooked that these statistics are taken largely from hospital records, and the larger percentage of males thus shown would be susceptible of explanation from the fact that, as a general rule, these hospitals are more largely attended by males than females.

The age at which gastric cancer occurs is shown by the following table, comprising 2038 cases collected by Welch from various sources:

Age	10–20	20–30	30–40	40–50	50–60
Number of cases	2	55	271	499	620
Per cent.	0.1	2.7	13.3	24.5	30.4

Age	60–70	70–80	80–90	90–100	Over 100
Number of cases	428	140	20	2	1
Per cent.	21	6.85	1	0.1	0.05

In the small series of 46 cases from Jefferson Hospital the frequency of cancer of the stomach during the various decades is shown to be as follows: Twenty-five to thirty, 2; thirty to forty, 10; forty to fifty, 10; fifty to sixty, 18; sixty to seventy, 5; seventy to seventy-five, 1. These figures are principally interesting from the fact that even in such a small series of cases a close correspondence exists with the very large series analyzed by Welch. In both it will be seen that about three-fourths of all the cases are to be found between forty and seventy years of age, and that the decade during which the greatest number of cases occurs is between fifty and sixty years of age. Nevertheless, considering the number of those living between sixty and seventy years of age, the mortality from gastric cancer is probably as great during that period of life. At least, such a deduction may be drawn from an analysis of statistics including a large number of cases.

Analysis of other statistics, as of those collected by Brinton and by Lebert, although in each a much smaller number of cases is included, simply gives results confirmatory of the conclusions to be drawn from the large number of cases brought together by Welch. It would seem, therefore, that the predisposing influence exercised by age to gastric cancer is conclusively set forth by this table. The occurrence of cancer of the stomach under the twentieth year of age is to be regarded as extremely rare; in the series above quoted it occurs in but 2 at this period of life. Matthieu[1] has subjected to analysis all the cases of gastric cancer occurring under thirty-four years of age,

[1] *Du Cancer précose de l'Estomac*, Paris, 1884.

and found that the total number recorded in literature at the time of his inquiry (1884) was but 27. Of this number but 3 occurred under the twentieth year.

Pre-existing local conditions have been thought to exercise an important influence in the predisposition to the disease. That traumatism to the epigastric region plays a part of any importance in the predisposition to the affection is a view that is probably not tenable. The frequency with which such a circumstance is held responsible, especially by the patients themselves, for a subsequently developing cancer, is probably owing to coincidence, and in many of such cases the probability is that the growth had existed before the injury in a latent form, so far as symptoms are concerned, and the injury did no more than draw attention to the seat of injury.

That chronic inflammations of the gastric mucous membrane predispose to gastric cancer was a view long held, but without adequate proofs. While, of course, some instances of the disease occur in an organ already the seat of a chronic gastric catarrh, there are but few facts that can be adduced to prove that such was the cause of the growth. On the contrary, it is surprising how small is the proportion of cases of cancer of the stomach that give a history of long-continued indigestion preceding the development of the growth and the symptoms characteristic of it.

That chronic ulcers of the stomach, either open or cicatrized, predispose to the disease may be regarded as an established fact. Those ulcers of long standing with thickened and indurated edges, and in which it seems impossible for complete cicatrization to take place, are most likely to subsequently show a cancerous degeneration. Various observers, Meyer,[2] Hauser,[3] Heitler,[4] have reported undoubted instances in which the secondary development of carcinoma has taken place in the cicatrix, or in the thickened margins of a gastric ulcer. Various other influences have at times been thought to predispose to gastric cancer, but there are no facts to warrant the assumption that such conditions as depressing influences, mental worry, disappointment, anxiety, or grief can in any way affect the predisposition to the disease.

The influence of heredity in the causation of gastric cancer is a question that belongs to the consideration of cancer in general rather than to the purposes of the present article. Very great variations exist in the conclusions arrived at by different observers as to the frequency with which, in instances of cancer, a history can be obtained of other members of the family having been affected by the disease. Welch

[1] *Inaug. Dissert.*, Berlin, 1874.

[2] *Das chronische Magengeschwür*, Leipzig, 1883.

[3] "Entwicklung von Krebs auf Narbigen-grunde im Magen," *Wiener med. Wochenschr.*, 1883, No. 31.

places it as high as 14 per cent., while Lebert gives 7 per cent., and Halbertin 8 per cent.

The parasitic theory of the causation of carcinoma is one against which, at the present time, the verdict of "not proven" will have to be rendered. The fact that favorable results have been obtained in the treatment of sarcoma, as well as carcinoma, from the use of the blood-serum of horses which have been treated by the coccus of erysipelas, would seem to point to the origin of this disorder as being parasitic. The conclusive proofs, however, are wanting, and we are still in the dark as to the actual origin of cancer.

Treatment.

Unfortunately the treatment of cancer of the stomach is limited to the management of symptoms and to the prolongation of the life of the patient by the use of palliative measures. We possess no drug, nor method of treatment, that in any sense can be regarded as specific or curative in action. While this is entirely true, several drugs have at various times been loudly proclaimed as possessing positive curative powers in this disease. Although this is not in any sense to be regarded as established, yet several of these remedies have at least the power of modifying the prominence of certain symptoms, of rendering the patient more comfortable, and even, I am convinced, in some cases at least, of prolonging life.

One of the most conspicuous examples of this class of drugs is to be found in condurango, a remedy that originally owed its popularity to its introduction by Friedreich of Heidelberg, in 1874, as a specific against cancer. While not acting in any way as was first claimed, it is beyond doubt that condurango is an excellent stomachic, and it acts beneficially in gastric cancer by its favorable influence upon the accompanying gastric catarrh, and in the same way as it is found to act when administered in a chronic gastric catarrh of primary origin. Condurango may be given in the form of a decoction which, according to Friedreich's directions, is prepared by macerating half an ounce of condurango bark with twelve ounces of water for twelve hours, and then boiling down to six ounces and straining; of this the dose is a tablespoonful three times daily. It is more usual, however, in this country to administer the fluid extract of condurango, in doses of 20 or more drops, three or four times daily.

Einhorn[1] has recommended the internal use of methylene-blue in cancer of the stomach, and states that by its employment in 8 cases of cancer affecting either the stomach or the œsophagus, a great improvement in most of the symptoms took place in 3. In one case a tumor of considerable size which had occupied the gastric region

[1] *Deutsche med. Wochenschr.*, 1891, No. 18.

apparently became somewhat smaller after about three weeks' use of the drug. In this instance the patient continued the use of the remedy uninterruptedly for about nine months, with the result that during that time there was complete freedom from pain and an apparent arrest in the growth of the tumor. Subsequent to this, however, the symptoms in an aggravated form returned, the tumor commenced to grow, and death shortly occurred.

I have had but little experience with methylene-blue, and cannot, therefore, attest its worth ; it is best administered in capsules in doses of about 3 grains twice daily. With the use of condurango my experience has been much more extensive, and I believe it to be of advantage in the treatment of the disease, not as a specific but in the manner above indicated. I am in the habit of following the advice of Ewald, and giving in conjunction with condurango hydrochloric acid, as this ingredient of the gastric juice is always absent or greatly lessened in gastric cancer.

Apart from the use of these drugs, which may be said to be given on account of their influence in modifying the course of the disease, the medical treatment of gastric cancer is purely symptomatic. Pain is present in all cases at some period of the disease ; it was a symptom calling for treatment in all of the 46 cases taken from the Jefferson Hospital records. To alleviate the patient's suffering cocaine may be used, although it is of doubtful efficacy. Of much more benefit is chloral hydrate, particularly for the distress arising from the decomposition of food or from the extension of ulceration. Its effect is sedative, but in some cases, as Ewald has pointed out, its local action cannot be taken advantage of because of the predominance of its hypnotic properties. It is best given in solution, in doses of about 7 grains every two or three hours. While these drugs, as well as other milder sedatives, are of advantage in the earlier stages of the disease, sooner or later recourse must be had to opium, or one of its derivatives, to relieve the patient's sufferings. Nor need the fear of instituting the opium-habit deter us from the administration of the drug in sufficient quantities to afford the required relief. Opium itself may be administered in the form of suppositories or taken internally in the form of pills, the latter being preferable, as some effect is to be expected from the local action of the drug. There are objections, however, to the use of opium that apply in a much less degree to its derivatives, morphine and codeine, especially the latter. The principal objection is that it tends to still further paralyze the already sluggish intestinal peristalsis. It is better, therefore, to administer morphine or codeine in doses sufficiently large to quiet the pain, and always if possible by the mouth, in order to secure their local analgesic effects. Belladonna, or atropine, may be added with

advantage, as its action tends to counteract the constipating effect of the opium.

Vomiting occurred in 42 of the 46 Jefferson Hospital cases. The persistence of this symptom depends somewhat upon the location of the lesion. I have seen cases, notably one of diffused carcinoma at the Philadelphia Hospital, in which almost the entire gastric wall was involved in the growth, and in which vomiting was absent during the entire course of the disease. In the particular instance referred to, and this is usually the case, the orifices of the stomach were but slightly implicated. The symptom is frequently relieved by the use of opium or morphine, given internally or hypodermically. In many instances it is only necessary to administer small pieces of ice, with a dash of brandy or a few drops of chloroform; small quantities of carbonated water, iced, and frequently repeated, will also prove of use; in the same way champagne may be employed. At times I have controlled this symptom by the use of equal parts of Vichy water and milk, rendered very cold, and taken in small amounts at frequent intervals. In addition, in the way of drugs, may be tried hydrocyanic acid, creasote, carbolic acid, or chemically pure oxalate of cerium. In those instances in which the vomiting results from the stagnation of food in the stomach, especially when the lesion is pyloric in location, and the contents of the stomach have become fermented and decomposed, the best relief is afforded by lavage performed in the manner already described under the treatment of gastrectasis.

Hæmatemesis, though frequent, is not often an urgent symptom; it occurred in 33 of the Jefferson Hospital cases. By the nature of the lesion the blood-loss is rarely very great, and usually consists in the ejection of the characteristic coffee-ground material. When large, it is best controlled by the use of cold, applied locally to the epigastrium and taken internally in the form of cracked ice. In addition we rely upon rest and the administration of opium and ergot, maintaining the patient's nutrition by rectal feeding.

Constipation is to be relieved by the mild vegetable aperients, or by rectal injections, or glycerin suppositories; the salines are avoided, as they unnecessarily add to the patient's exhaustion. Diarrhœa should be controlled by opium given by the rectum as suppositories, or in the form of small enemata of starch-water and laudanum.

The *diet* in gastric cancer is to be regulated with the view of maintaining the nutrition of the patient as long as possible. The dictum of Trousseau is that, in the selection of the particular articles of food, the patient should be referred to his own experience. Bearing this in mind, the important point to be considered is that the more nourishment the patient can take and assimilate the more prolonged will be his life. Owing to the diminution in the secretion of

hydrochloric acid, meat and other foods of an albuminous nature are not well borne, and the patients are found to do better upon a diet of starches and vegetables. Meats, however, that are prepared in such a way as to render them easy of digestion may be advantageously given. In this way, meat well scraped and given raw or broiled may be assimilated. Milk predigested, matzoon, koumyss, kefir, and the various peptone preparations are to be relied upon in many cases. Somatose, Leube's beef-solution, Kemmerich's peptone, Mosquera's beef-jelly, or a good beef-peptone will serve as examples of this class of foods. In addition, raw or soft-boiled eggs, the white meat of fowl, fish foods, and a small quantity of well-baked or toasted bread may be used to vary the dietary. Soups made of leguminous flour, and weak tea or coffee, are admissible in most cases. Fatty substances, on account of their liability to undergo decomposition when their stay in the stomach is prolonged, are to be prohibited. So also are those liquors in which fermentation has been incomplete, and which still contain a large proportion of fermentable substances. Foods of all descriptions are to be rendered as fine as possible, and all substances containing a large amount of dense connective tissue or that are encased in tough coverings are to be avoided. In the later periods of the disease the choice of foods becomes extremely limited, and it is then usually necessary to be governed by the previous experience of each individual case.

The employment of mechanical measures for the relief of gastric cancer is a subject more properly discussed in surgical treatises, and even their brief consideration is not called for in the limits of the present article.

GASTRIC ULCER.

A NUMBER of factors seem to influence the liability of an individual to become the subject of peptic ulcer; and while any one condition cannot as yet be said to be the positive and definite exciting cause of the affection, it is probable that it arises from one or more of several conditions. That the disease is of great frequency is conclusively proven by the extensive statistics of Welch and Brinton, both of whom agree in the statement that ulcer of the stomach, cicatrized or open, is to be found in about 5 per cent. of persons dying from all causes. While this represents the post-mortem frequency with which gastric ulcer, or the evidence of its previous existence, is found, its clinical manifestations are not met with in anything like the same degree of frequency. Welch himself calls attention to the fact that the statistics relating to cicatrices are not as

trustworthy as those relating to open ulcers, as it is not always possible from the character of the cicatrix to determine positively that its original cause has been a peptic ulcer, and not a loss of substance arising in some other way. Nevertheless, the statistics relating to open ulcers alone show that they are to be found in from 1 to 2 per cent. of persons dying from all causes, a figure that is still greatly in excess of the frequency with which the disease is encountered clinically. From the figures given by Lebert [1] it would appear that gastric ulcer occurs clinically in about 6 out of every 1000 cases treated for general diseases; thus, out of 41,688 cases coming before him between the years 1853 and 1873, the clinical diagnosis of gastric ulcer was made in 252 cases.

The frequency with which gastric ulcer prevails seems to vary in different regions; for Munich it is placed by Nolte at 1.23 per cent., for Berlin the frequency is placed by Berthold at 2.7 per cent., while Griess gives 8.3 per cent. for Kiel, and Stark 13 per cent. for Copenhagen. Inasmuch as gastric ulcer is to be ascribed, in part at least, to local irritation of the gastric mucosa, the varying frequency with which the disease is encountered in various localities is to be accounted for by the variations in the mode of living and the character of the food in general partaken of in different places. Of particular interest from this standpoint have been the investigations of Von Sohlern [2] which have shown that in certain parts of the Rhön mountains and the Bavarian Alps, as well as in the greater part of Russia, gastric ulcer is rarely met with. This apparent immunity from the disease he ascribes to the fact that the inhabitants of these regions live almost exclusively upon a vegetable diet, the particular effect of which is that a larger amount of the salts of potassium is added to the blood than under a mixed diet. As the red blood-cells are the chief carriers of potassium, Von Sohlern asserts that the increased quantity of this substance constantly added to the blood is to be regarded as the cause of the relative immunity from ulcer possessed by vegetarians. Upon this hypothesis he advises, as a prophylactic measure against ulcer, a diet rich in vegetable matter and the administration of potassium salts.

As to the predisposing influence exercised by sex and age, the various statistics seem to be agreed. All statistics show that the disease occurs more frequently in the female than in the male, the proportion being nearly as two to one. Welch found the proportion to be 2 males to 3 females, his analysis including 1699 cases. I have collected from the records of the Jefferson Medical College Hospital

[1] *Krankheiten des Magens*, Tübingen, 1878, S. 196.

[2] "Der Einfluss der Ernährung auf die Entstehung des Magengeschwürs," *Berl. klin. Wochenschr.*, 1889, No. 14.

55 cases of gastric ulcer that have been treated there during the last few years; of these, 15 occurred in the male and 40 in the female sex.

As regards age in its influence upon the development of the disease, while the affection has occasionally been met with in early childhood we may regard that period of life, up to the tenth year or a little older, as practically free from liability to the disease. Between the ages of twenty and forty gastric ulcer is most common, while its mortality is probably highest between forty and sixty years. From Welch's statistics three-fourths of all the cases are found to occur between the ages of twenty and sixty. The decade during which the largest number of cases is found is between twenty and thirty years; this is particularly true of the female sex, the larger number of males developing the disease during the subsequent decade, from thirty to forty years. Analysis of the 55 cases at Jefferson Hospital with particular reference to age shows that the disease prevailed at the various ages as follows: Ten to fifteen, 1; fifteen to twenty, 6; twenty to thirty, 24; thirty to forty, 16; forty to fifty, 4; fifty to sixty, 4. Of course such a series of cases is too small for the drawing of definite conclusions, but it is interesting for the reason that it coincides with the main features of those statistics that include a larger number of cases.

That occupation plays an important part in the predisposition to gastric ulcer is a question that admits of some doubt. Nevertheless, the prevalence of the disease among individuals following certain occupations is a subject that has excited attention since the early period of our knowledge of the disease. It is thus found that housemaids, female cooks, and needle-women show an apparent tendency to the affection. Likewise those whose occupation necessitates a more or less continuous pressure upon the epigastrium appear to be thereby predisposed to gastric ulcer; such individuals, for instance, as shoemakers, weavers, and, because of the posture that they habitually assume, tailors. Gastric ulcer occurs in association with various other diseases, especially with menstrual disorders, chlorosis and anæmia, and the relationship, to a certain extent at least, is doubtless a causal one.

The exact etiology of gastric ulcer, however, is as yet involved in some obscurity. Efforts have been made by various investigators to elucidate the subject by experiments upon animals. Lesions of the mucous membrane of the stomach have been produced by the artificial production of emboli brought about by ligating small vessels; by causing hæmorrhages through injury to certain parts of the central nervous system; or by directly subjecting the gastric mucosa to the influence of certain chemical or other irritants. The loss of substance resulting from any of these procedures, however, does not conform to

the characteristics of the gastric ulcer, the tendency of which is to spread, and to cicatrize but tardily. The investigations of Griffini and Vassale proved that the mucous membrane under these circumstances is rapidly replaced—even the true peptic glands being formed from the superficial epithelium first covering the wound. So rapidly does this healing process take place that in from ten to fifteen days not a trace of the injury will remain. From the results of these experiments it would seem that a simple loss of substance is not sufficient to cause the chronic ulcer, to produce which it appears to be agreed there must be, in addition to the local lesion, some associated influence; namely, "A disproportion must exist or be created between the secretions of the gastric glands and the nutritive blood, either synchronous with or previous to the appearance of the local lesion" (Ewald). The following experiments would seem to confirm this theory: By producing gastric hæmorrhages as the result of section of the spinal cord, and then introducing into the stomach a $\frac{1}{2}$ per cent. solution of hydrochloric acid, Koch and Ewald[1] were enabled to produce deep ulcers in the stomachs of animals. Quincke and Daettwyler[2] made the animals anæmic by venesection, and Silbermann[3] disintegrated the corpuscles and produced hæmoglobinæmia by the introduction of substances into the circulation, and in both instances the artificially produced lesions healed very gradually and presented an appearance similar to that of real ulcer. In one of Silbermann's experiments the lesion failed to heal at all, and perforation occurred. If gastric ulcer developed after all lesions of the gastric mucous membrane in which a loss of substance occurred, the disease would be even much more frequent than it is. On the contrary, innumerable and striking instances are on record in which the gastric mucosa has suffered severe injury without a true ulcer developing. Indeed, it is almost the rule in such cases, as in the experiments upon animals above quoted, that rapid healing takes place. Nevertheless, occasionally true ulcer develops subsequently to a traumatism, as in one of the cases referred to by Welch and reported by Williams.[4] The case was that of a boy who drank some strong mineral acid, and after three or four days of suffering apparently fully recovered. Two months afterward, however, sudden death occurred from the perforation of a gastric ulcer.

The theory advanced by Virchow that there exists an important relation between diseases of the heart and blood-vessels and gastric ulcer is applicable to only a limited number of cases. Virchow held

[1] Ewald, *Klinik*, etc., 1. Th. 3. Aufl. S. 122.
[2] Quincke u. Daettwyler, *Correspondenzbl. f. Schweizer Aerzte*, 1875, S. 101.
[3] *Deutsche med. Wochenschrift*, 1886, N. 29, S. 497.
[4] *The Lancet*, April 9, 1842.

that the ulcer resulted from embolism or thrombosis of a nutrient artery supplying a certain part of the mucous membrane, and that the resulting infarct was acted upon and destroyed by the gastric juice. That this theory explains the occurrence of the disease in certain instances only is proved by the fact that gastric ulcer occurs in individuals not the subjects of cardiac disease; that the affection occurs most commonly between the twentieth and fortieth years, and therefore at a time of life when vascular lesions are not common; and the further fact that the evidences of arterial thrombosis or embolism in the vicinity of the ulcer are not to be found in many cases.

The fact that hydrochloric acid is with but few exceptions present in the gastric juice in cases of ulcer, and the further fact that it is almost always present in excess, have served as a basis for the theory that this is the most important etiological consideration in the production of the disease. That there are exceptional cases, however—and Einhorn has cited two very striking instances—in which hydrochloric acid is not only not in excess but is actually absent from the gastric juice, serves to prove that hyperacidity, though without doubt the most frequent, cannot be regarded as the only cause of gastric ulcer. Einhorn is right in concluding, therefore, that gastric ulcer is not always produced by one and the same factor.

Treatment.

The successful treatment of gastric ulcer must meet the following indications: The stomach must be placed as far as possible at complete rest; existing hyperacidity must be corrected, if necessary by special means; the state of the blood, anæmia, chlorosis, etc., must be improved; and symptoms must be relieved.

The first indication is complied with by putting the patient to bed and by the careful regulation of the diet, or the withdrawal for a time in certain cases of all alimentation by the stomach and resort to rectal feeding. In other words the patient is put upon the rest-cure, a method of treating gastric ulcer to which Leube[1] and Von Ziemssen[2] first called particular attention, although the treatment had previously been carried out in England by W. Fox[3] and B. Forster. Under this treatment the patient is placed at rest in bed, a dietary such as will make the least demand upon the stomach is selected, and is supplemented, or replaced if necessary, by rectal alimentation; to lessen irritation and to relieve pain, the application externally of moist heat over the upper abdominal area is also added. The treatment continues for two or three weeks, and longer if necessary. The diet is to be

[1] *Magenkrankheiten*, S. 117. [2] *Volkmann's Samml. klin. Vorträge*, No. 15.
[3] *Reynolds' System of Medicine*, vol. ii. p. 944.

liquid, of which milk constitutes the basis to-day as it has ever since its use was first recommended by Cruveilhier, who also gave us the first careful and systematic description of the disease. Milk may be administered alone, or its tolerance by the stomach may be rendered more ready by the addition of lime-water, strained oatmeal, or barley; or by the addition of an equal quantity of Vichy water, a method of administration to which I am particularly partial, especially when the stomach is in a very irritable state. At this period of the treatment, also, the diet may be varied by the use of one of the reliable peptone or peptonoid preparations now so readily available.

Nourishment should be administered frequently during the first week of treatment, in small amounts at a time, and should be partaken of slowly. Thus, from four to five ounces of either of the foods just mentioned may be given the patient every hour. No change should be made in the character of the food until the third week, excepting that during the second week of treatment the quantity of food at each feeding should be increased and the frequency of its administration diminished to every two hours. During the third week the diet is supplemented by the use of leguminous soups, and later by vegetables of a like character; now we may give well-boiled rice, raw or soft-boiled eggs, tapioca, farina. From these the diet gradually changes to that ordinarily partaken of, beginning with meat that has been well scraped and given at first raw, later broiled. In the subsequent daily diet of the patient it is of course important to exclude foods that place too great a tax upon the digestive powers of the stomach. The regimen prescribed by Von Ziemssen and Leube also directs the removal, at the beginning of the third week, of the moist applications that have up to this time been continuously applied to the epigastrium, usually in the form of flaxseed poultices; and it further allows the patient at this time to begin sitting up, the length of time being increased each day, so that during the fourth week he may be allowed out of doors.

This system of rest-cure, carried out in its completeness, also includes a "Trink-Kur" in the form of hot Carlsbad water or a solution of Carlsbad salts, taken twice daily, morning and evening, the latter just before retiring. This addition, however, constitutes no very important part in the successful treatment of gastric ulcer, as the great majority of cases get along quite as well without the Carlsbad salts.

In very many cases of ulcer it is necessary to give the stomach a complete rest for a few days, maintaining nutrition by the resort to rectal alimentation. Indeed, I believe it to be a good practice in all cases presenting symptoms of a decided character to institute this method of feeding, and rest the stomach for three or four days. In

cases of marked severity I have frequently in this way rested the stomach for periods varying from ten days to two weeks, this long continuance having been rendered necessary by hæmatemesis, or frequent vomiting without blood, and by excessive pain. It is usually my practice in this class of cases not abruptly to stop rectal feeding as soon as the stomach begins to take food, but so to arrange the dietary that as stomach-feeding is increased in activity rectal feeding is correspondingly diminished. In this way any sudden strain upon the stomach by the demands of digestion is avoided, a condition not unlikely to arise when the organ which has been fasting for five days or more is at once called upon to meet the necessities of nutrition. The nutritive enemata should not be over five or six ounces in quantity, and may consist of milk rendered alkaline by the addition of a small quantity of common salt, and into which one or two raw eggs may be broken and well beaten. Instead of the egg a half-ounce of peptone may be added to the milk, or the enema may consist of peptone and water instead of milk. I believe, in those cases where rectal feeding should be maintained for so long a period as five days and when we must depend upon it solely to maintain nutrition, that it is better to employ the injections more frequently than is usually deemed necessary. It is important in the treatment that the patient's strength be maintained, that not too much flesh be lost, and that the quality of the blood be rendered as high as possible, as all these conditions must have an influence in hastening healing of the ulcer. For these reasons it is my opinion that nutritive enemata should be given at least five times during the course of the day. While rectal feeding is in progress the patient's comfort is enhanced, and the quietude of the stomach not interfered with, by the occasional administration of small pieces of ice or occasional sips of Vichy water.

In cases where hyperacidity exists, and these are in the majority, it becomes necessary to neutralize its effects. If it be true that this condition has much to do with the production of an ulcer, it is important, in order that a cure may be effected, to reduce to a minimum this causal factor. Of course this is accomplished by the rest which we impose upon the stomach and the character of the diet subsequently administered, for the neutralizing effect of milk upon acids has been well established. Nevertheless, in many cases these measures will not prove sufficient, as the continuance of pain, vomiting, and acid eructations would to a certain extent indicate; it then becomes necessary to order the systematic and frequent administration of an alkali. For this purpose no better preparation than bicarbonate of sodium can be given, alone or in combination with other alkaline salts. It is administered by Ewald in combination with rhubarb and sugar, to obtain by the former a gentle action upon the bowels, while

the addition of sugar has been recommended on account of its pain-quieting qualities. Thus:

℞. Magnes. ust.,
Sodii carbonat.,
Potassii carbonat., āā. gr. lxxv (5.0);
Pulv. rhei, gr. cl (10.0);
Sacch. lactis, ʒvij (28.0).—M.
Sig. As much as will rest upon the point of a knife, dry on the tongue, every hour.

As soon as the patient's condition shows signs of improvement, and the gastric irritability is sufficiently allayed to allow the return to a more ordinary dietary, we must meet the indication to improve the general nutrition. The frequency with which the state of the patient's blood seems to act as the basis for the chain of events resulting in gastric ulcer must be borne in mind. In many cases of anæmia and chlorosis, as well as associated with menstrual disorders, it is not unusual to find a hyperacid state of the gastric juice, and, it matters not whether the blood-condition be the cause or the effect, its correction is demanded as early as possible.

The remedies upon which we rely to accomplish these results are iron and arsenic: iron when the condition of the blood is one of decided anæmia, arsenic when a more general effect upon the system at large is desired; the two, however, are administered in combination with decidedly advantageous results. It matters not what particular preparation of iron is used if its assimilation is secured. Ewald strongly endorses the use of the chloride of iron, as one of the most easily assimilated preparations. Arsenic is best employed in the form of arsenous acid, and should be given in increasing doses. The use of these drugs should be continued for months, the arsenic, as stated, in increasing doses, with occasional periods of rest from its use; after each interval of rest the dose to begin with should be the minimum one and then gradually increased for three or four weeks; while after this period its use should be discontinued for a few days, in the way mentioned above.

Not every case of gastric ulcer is in such circumstances that the rest-cure as above outlined can be followed out. These individuals have to be treated as "ambulatory" cases, and this is the class to which the use of bismuth and nitrate of silver is especially applicable. Bismuth has for a long time proven itself of great advantage in various gastric disorders, especially those attended with pain. In the treatment of gastric ulcer the latter-day tendency, responding to the influence of the French physicians, is to give it in very large

doses suspended in water. Thus from 45 to 75 grains are administered three times daily, before meals, suspended in a wineglassful of water. Ewald advises much larger doses administered in the same manner. "Am rationellsten scheint mir die Methode der Französen, welche grosse Mengen, 10–15 Grm. in Wasser gelöst, nehmen lassen."[1] When bismuth is employed its use should be uninterrupted for two or three weeks. It is obvious that in the employment of these enormous doses care should be taken that a pure article of the drug be obtained, and especially that it be free from arsenic. This precaution is not so necessary now as it would have been formerly, as preparations of the drug free from arsenic are, at the present day, much more easy to secure.

For its supposed local effect upon the ulcer nitrate of silver has also been extensively used in the treatment of the disease, and evidence of its advantages is given by good authorities. It is best administered in solution, in doses of about gr. $\frac{1}{3}$ three or four times daily, the treatment being continued for three weeks or longer.

While under either of these forms of treatment, the patients who are not able to undergo the rest-cure are permitted to attend to their daily duties, although great care in the diet is as necessary, although not as easy to carry out, as under the rest-cure plan; the diet should therefore conform as nearly as possible to that already outlined.

The symptoms more particularly requiring treatment in gastric ulcer are pain, vomiting, and hæmatemesis, and all are of frequent occurrence during the course of the disease.

Pain of such severity as to call for special treatment was present in 50 of the Jefferson Hospital cases. In many instances, perhaps the majority, the outline of treatment as already described is sufficient to allay these symptoms. Thus, pain usually succumbs to the influence of the enforced rest, to the administration of a non-irritating and neutralizing diet, or to the use of alkalies, subnitrate of bismuth, or nitrate of silver. Nevertheless, special treatment directed to the relief of pain becomes necessary, not only for the constant pain incident to gastric ulcer, but also for the attacks of gastralgia which in many instances are of such frequent occurrence. Almost as a matter of course we turn first to morphine to alleviate the patient's sufferings, the mode of administration being either by the mouth or subcutaneously. Although this is our main reliance, we must not overlook the advantages to be derived from cannabis indica, belladonna and hyoscyamus; especially from the use of the first-mentioned drug have I obtained the most satisfactory results, when given in combination with morphine or codeine.

Vomiting as a symptom seems to be associated with the gastralgic

[1] *Klinik, etc.*, Th. 2, S. 431.

attacks, so that the treatment instituted for the relief of the latter serves the additional purpose of checking the former. For reasons already given, the most potent factor in bringing about relief from vomiting is rest and the carefully regulated dietary, as well as rectal feeding. The influence of these may be enhanced by allowing the patient to swallow small pieces of ice with a few drops of chloroform. It has been recommended that when vomiting is especially severe and intractable, lavage be performed. Unquestionably marked relief frequently follows this procedure, but it cannot be regarded as entirely free from the danger of causing hæmorrhage or perforation, and I consider myself fortunate in having been forced to its use upon only very rare occasions.

Hæmatemesis in the course of gastric ulcer requires careful management and is a symptom of frequent occurrence. The necessity for all the precautionary measures already advised in the treatment of the disease becomes increased and as much care is required in the treatment of small hæmorrhages as in those that are profuse, as the smaller blood-losses may be premonitory of the larger. It is of prime importance that absolute rest, both general and local, be enjoined. If not already in bed the patient should without delay be placed there, and recourse at once had to rectal feeding. The patient may be allowed to swallow small pieces of ice or small quantities of ice-cold fluids, and ice-cold applications should be placed upon the abdomen. If there be much vomiting or restlessness, morphine should be administered hypodermically. With the view of directly controlling the hæmorrhage, ergot or ergotine may be used subcutaneously. If the hæmorrhage be profuse and show a tendency to recur, Ewald recommends the repeated washing out of the stomach with ice-cold water. Undue retching and straining usually incidental to the introduction of the stomach-tube should be guarded against by cocainizing the pharynx or by the previous injection of morphine. If, notwithstanding our efforts, the patient pass into a condition of collapse, resort must be had to the subcutaneous administration of diffusible stimulants, to stimulating rectal enemata, and the external application of heat. If the patient become exsanguined, transfusion of blood may be resorted to; or, as is at present more generally practised, and with better results, the infusion into the subcutaneous tissues of a pint or more of normal salt solution should be performed. In such cases also, in order that the blood may be retained in the great organs whose function is necessary to sustain life, a ligature may be applied around one, or several, of the extremities.

In perforation treatment has rarely been followed with any degree of success; it should be carried out along the general lines already laid down. The outlook being so unfavorable recourse has lately

been had to surgical interference, and several successes have been recorded.

The treatment of ulcer as it occurs in the œsophagus and duodenum is, in general, about the same as when its location is in the stomach. In the case of duodenal ulcer, however, the lesion is more serious and more intractable to treatment than is gastric ulcer; therefore the rest-cure must be rigorously carried out, and the greatest care should be exhibited in the selection and administration of nourishment, in order that the healing of the ulcer may be effected as rapidly as possible.

DISEASES OF THE LIVER, GALL-BLADDER, HEPATIC DUCT, AND SPLEEN.[1]

By JOHN H. MUSSER, M. D.

Functional Disorders.

The work of physiologists during recent years has quite revolutionized our ideas concerning the importance of the liver in the human economy. Formerly we attributed to it simply the formation of bile; now we know its functions are more numerous and of vastly greater importance. From out the confusion of conflicting physiological evidence there appear certain well-established facts regarding its function. It converts glucose into glycogen; it secretes bile; in it occur complicated metabolic changes concerning proteids, including the formation of urea and uric acid and the destruction or modification of poisonous bodies absorbed by the gastro-intestinal tract; it also is a graveyard for the worn-out red blood corpuscles. Concerning these functions we have some definite knowledge; but, as Michael Foster justly remarks, it consists at present mostly of guesses and of gaps.

Our knowledge being so imperfect, it is not as yet possible to correlate the conceivable disturbances of these functions with certain well-recognized clinical pictures. From the works of Strümpell, Fagge, Pye-Smith, Charcot, and Jaccoud, representing the modern state of medicine in three countries, we can form an idea of the difficulties. These authors either do not attempt any classification of the symptoms or do not mention them at all.

We frequently hear the phrases biliousness, sluggish liver, torpidity of the liver, excess of bile, etc. The clinician who keeps abreast of the work of physiologists smiles. Yet the practitioner who uses these terms has in mind a well-defined clinical picture, no matter how badly he name it, and with the drugs that experience has taught him to value he cures his patient—which is the end of therapeusis. Therefore, while therapeutics waits for physiology to supplant its empiricism with rational methods, we must speak of biliousness, and cure our patients with calomel.

[1] The author desires to acknowledge his indebtedness to Dr. Frederic H. Howard for assistance in the preparation of this article.

Organic Diseases.

The liver, like other glands, consists of a highly specialized and sensitive parenchyma and a more indifferent connective-tissue framework. The latter contains the bloodvessels and the bile-ducts, which play an important part in the morbid processes of the organ. The liver is invested over a great part of its surface by a reflection of peritoneum. This membrane, although frequently involved in diseases of the liver, is not, strictly speaking, a part of the organ, and changes in it are properly included among peritoneal affections. Each of the tissues of the organ is subject to the general pathological changes that such tissues suffer in other parts of the body. The parenchyma may undergo fatty degeneration, the connective tissue be the seat of suppurative or proliferative inflammation. Changes in these two tissues usually go hand in hand. The channels of excretion are so large that morbid processes may arise in them independently of the proper secretory substance. Thus suppurative inflammation, cancer, and obstruction of the ducts may occur. Finally, the organ may be the seat of parasitic invasion. It is here the echinococcus most often localizes, producing the hydatid cyst.

General Treatment of Diseases of The Liver.

Remedial measures other than drugs are as valuable in the treatment of hepatic diseases as are all the resources of the pharmacopœia. The removal of the cause of the disease, regulation of the diet, habits, exercise, bathing, clothing, physical and mental labor are powerful and essential factors for good, while the effects of climatic and balneological therapeutics are readily appreciated. Since the liver holds such vital relations with general metabolism it is essential, when that organ is functionally impaired, that all influences inimical to normal processes be removed and the general health fortified.

Diet in Liver Diseases.—Much can be accomplished by carefully regulating the diet. At the outset it will usually be necessary to cut down the total quantity of food. As Professor Osler says, "People habitually eat too much." It is of vital importance to give such foods as are easily digestible; for indigestion, a derangement bad enough of itself, is doubly harmful when the function of the liver is impaired. There are certain foods which, though they may or may not cause indigestion, yet do harm by irritating the liver or throwing upon it extra work; such are spices and condiments, sugars, starches, and fats. A limited amount of properly prepared starchy foods is allowable. Thus, toasted bread or cereals may be used judiciously. Lettuce, celery, spinach, tomato, and oyster-plant make pleasant and harmless variations in the diet; but beans, potatoes, peas, cabbage,

and turnips should be interdicted. In the later stages of organic hepatic disease and in advanced congestion red meat should not be allowed, but white meats and game are admissible. Fish and oysters can always be used, except salmon, eel, and other fish of an oily nature. Eggs and milk, and preparations of each, are proper if they agree with the patient; but some persons, on account of idiosyncrasy, find it difficult to take them. Often under these circumstances milk, which otherwise causes so-called "biliousness," may be used if it is sterilized or if it has previously been peptonized. It also may be more suitable to a patient if administered hot—not boiled, but scalded, and with a little salt added. Alkalies added to the milk render it less disagreeable at times. Lime-water, bicarbonate of sodium, or a carbonated alkaline water, such as Vichy, removes the unpleasant taste of which many patients complain, and renders the milk more readily assimilated. In place of milk, whey or buttermilk may be used; the slight acidity of the latter is very agreeable to some patients, and both appear to be of advantage if a diuretic effect is required. Nourishment may be sustained by koumyss and other artificially prepared forms of milk. To bridge over a critical period malted or condensed milk may be employed. The latter may be flavored with weak infusions of tea or cocoa to make it more palatable. Alcohol in any form is an evil in hepatic disease. If a stimulant seems to be required, the more acid clarets or the Rhine wines may be used. Coffee and chocolate are usually harmful, though cocoa if free from the oily substance that so frequently accompanies it, may be given. Very little liquid should be taken with the meals, but if given between meals or at bedtime, liquids are of advantage.

In the selection of food the dictum of the late Professor Flint is to be observed. The appetite and common sense are to be consulted. A rigid diet if continued too long is injurious. Variety is necessary, and an occasional return to general diet must be resorted to.

How and when to eat are questions not less important than what to eat. If the body is fatigued, fifteen minutes' rest in the recumbent position is to be insisted upon before partaking of food. Mastication must be thorough, and to this end defective teeth should receive attention and the pernicious habit of bolting the food discouraged.

Exercise.—An outdoor life and exercise within reasonable limits are of the greatest importance in the management of hepatic disease. It is a matter of popular knowledge that horseback-riding and rowing affect favorably the action of the liver. Bicycle-riding and walking are of less value, but have the advantage of availability. All forms of exercise increase the respiratory movements, and therefore accomplish a sort of massage of the liver. Manual massage must be prescribed for those who through weakness are unable to exercise.

Climate.—The climate selected for invalids suffering from hepatic disease should be stimulating and tonic in character. The mountains, the New England sea-coast, or camp-life in the Adirondacks, are to be recommended in the summer; while the winter months could be profitably spent in the Southern or Southwestern part of the United States. Foreigners in the tropics must return to the temperate zones. Enlargement of the liver dependent on malaria will not improve in paludal districts.

Clothing.—The clothing should always be warm, and its weight graduated to the temperature; woollens should be used and the extremities be well protected. Everyone who by occupation or residence is liable to congestion of the liver should have the hepatic region and abdomen protected by a heavy flannel bandage. Heavy boots should always be worn. The habit of wearing slippers should be corrected.

Bathing.—General baths, cold sponge-baths, or douches should be insisted upon in order to keep up the action of the skin, as well as for their tonic effect. The cold shower-bath, followed by a brisk rubbing, or a plunge in a tub of cold water, with rubbing afterward, providing reaction always takes place, will insure healthy action of the skin and give general tone to the patient. Such baths are particularly necessary in patients of sedentary occupation who lack opportunities for acquiring tone and keeping up that state of the system which attends high health. Sea-bathing with the usual precautions will be of great value to broken-down subjects.

Medicated baths are used for chronic diseases of the liver. The acid bath is the one most frequently employed. Eight ounces of nitro-hydrochloric acid are mixed with each gallon of water at 98° F. The solution may be applied as a compress. A flannel roller about a foot wide and long enough to go twice around the body is saturated in the acidulated water, wrung out thoroughly, and wrapped around the region of the liver. It should be covered with a piece of oiled silk slightly broader than the flannel, and may be worn several days or until decided irritation of the skin is produced. It should be changed every night. If an acid bath is given, the vessel must be of wood, earthenware, or porcelain.

Hot baths are prescribed at many of the springs where the waters are taken for liver diseases. At home the general hot bath relieves the pain of hepatic colic and aids the passage of a gall-stone. In congestion of the liver the hot bath, with good rubbing afterward, is of great service. The enlarged, congested liver after catarrhal jaundice is reduced by baths. The sitz-bath is of value for the relief of abdominal plethora. At Carlsbad peat- or mud-baths are used for the same purpose. After each hot bath the patient should rest

for two hours. The bath should not be taken until one and a half hours after a full meal, and not after violent exercise or great mental excitement; the morning hours are the best. The bath may be taken on retiring, although then additional rest is not secured. The water should usually be at a temperature of 90° F., but it may be raised to 100° F.

Hot baths are weakening, and should be taken only two or three times a week. If congestion of the brain, as evidenced by giddiness, noise in the ears, or pain in the head, occurs the patient should not take them.

The baths may be medicated, although the value of the medication is doubtful. Carlsbad Sprudel salt added to the water may be of service, or bicarbonate of sodium may be used. For stimulating purposes common or rock salt may be added to the water.

Vapor-baths and douches are often very useful. Douches of "needle"-baths, or alternating hot and cold douches played on the liver, are local stimulants of value. The Turkish bath may be used by the robust. In jaundice it aids in removing the discoloration of the skin.

Occupation.—Those who suffer from biliousness should not be engaged in sedentary occupations. The ideal employment for such is one that demands the greatest amount of outdoor work. This is not often possible; it is then necessary to order outdoor exercises, of which bicycle-riding is perhaps as eligible as any.

Occupations requiring constant nibbling at rich foods and condiments or sipping at alcoholic drinks are to be condemned. Workers in furnaces and in damp places, being exposed to sudden and marked changes of temperature or to repeated wetting of the skin, are more liable to hepatic disease.

Habits.—Luxurious habits must be dispensed with. In the prevention and treatment of hepatic disease the establishment of regular, systematic habits of life is of the greatest importance. Proper and fixed hours for retiring and rising, for meals, for work, for rest, for bathing and exercise, must be secured. If coupled with proper food, nothing is more certain to produce good results in medicine than a *régime* of this character.

Action of Drugs on the Liver.—Neither clinical observation nor physiological experiment has as yet made clear the mode of action of that class of drugs known as hepatic stimulants and cholagogues. We believe that some substances stimulate the hepatic cells to secrete more bile; these we call hepatic stimulants. Other drugs are supposed to increase the flow of bile and to stimulate intestinal peristalsis; these are called cholagogues. Experiments on lower animals with biliary fistula have proved that there are three undoubted pure hepatic

stimulants, namely: water, food, and bile salts. Concerning drugs experimental evidence is conflicting. All observers but one agree that sodium salicylate is an hepatic stimulant; but other drugs in the hands of different experimenters have given such varying results that Neumeister goes far and asserts that pure hepatic stimulants do not exist. But Rutherford and H. C. Wood point out many reasons why the experimental evidence thus far obtained is untrustworthy. In view of this fact, it were better at present not to discriminate too sharply between hepatic stimulants and cholagogues, but to apply the latter term to all drugs that increase the bile in the stools.

The ingestion of food is followed by an increased secretion of bile. The succulent vegetables such as spinach, tomato, and cresses appear to have peculiar stimulating properties, and they should therefore be included, unless otherwise objectionable, in any regimen designed to increase biliary secretion.

Water is another undoubted hepatic stimulant. It increases the quantity and fluidity of the bile. This stimulation has been shown not to be due to dilution of portal blood or to increase in portal blood-pressure. It is conjectured that substances in the intestinal wall, perhaps bile salts, capable of stimulating the hepatic cell are washed by the fluid into the portal blood in greater amount. Since the bile becomes more concentrated between meals and at night, water does most good when the stomach is empty. It should be taken hot between meals and at bedtime. Brunton and others have shown that the act of sipping is a cardiac and vasomotor stimulant, and thus a stimulant to all glandular activity. Therefore, all fluids should be taken slowly.

The benefit derived from the various springs to which hepatic cases resort is due largely to the amount of water ingested together with the strict hygienic regimen observed. A few words about the springs may be introduced here. Those best suited for cases of hepatic disease are Carlsbad, Marienbad, and Kissingen in Germany; Vichy and Contrexeville in France; and in this country Saratoga and Bedford. Cases of congestion, beginning cirrhosis, fatty liver, and cholelithiasis are benefited by a residence at one of these resorts. The action of the waters, particularly of hot springs, is weakening. It is by depletion that the patient is relieved. It is necessary, therefore, to complete a cure by residence at other springs which are more tonic or by rest and quiet in the mountains or at the seashore.

It has been thought by some observers that medicaments for the liver had better be taken in large quantities of water, fasting, in order that the liver may be promptly acted upon. In this manner Guitéras and Bruen used iodide of potassium in chronic catarrhal

jaundice in small doses in a glass of hot water before breakfast. Other drugs may be employed in a similar manner.

From what has been said of the incompleteness of our knowledge regarding pure hepatic stimulants it will be apparent that a classification of drugs used in liver disease based upon the amount of bile they cause to appear in the stools is the only practicable one. The drugs that possess the property of producing "bilious stools" are calomel, podophyllum, aloes, colchicum, euonymin, iridin, sanguinarin, ipecacuanha, colocynth, dilute nitrohydrochloric acid, sodium phosphate, potassium sulphate, sodium benzoate and salicylate, ammonium phosphate, mercuric chloride, rhubarb, olive oil, and turpentine. Three of these drugs, namely, sodium salicylate, olive oil, and turpentine, seem to possess the power of stimulating the secretion of bile. They apparently increase it in quantity and lessen its consistency.

The secretion of bile may be lessened by certain influences. This fact is of interest to the therapeutist only that he may guard against any such event, for it is seldom that an artificial reduction of the secretion of bile would be indicated. Diminished secretion may be brought about by cutting down the supply of food and water or by purging actively. The former acts by lessening the normal stimulus and the latter by removing from the intestines bile and food which, if absorbed, would act as stimuli.

Treatment of the Prominent Symptoms.—*Ascites.*—Rest in bed and a milk diet should first be instituted. By rest the general strength is conserved and the establishment of a collateral circulation facilitated. The milk diet spares the kidneys and makes the task of digestion lighter. Fluid may be removed from the peritoneal cavity by diaphoresis, diuresis, catharsis, and by paracentesis.

Profuse diaphoresis such as that produced by the hot pack and jaborandi will remove fluid, but other means less prostrating are more efficient and less objectionable. Therefore, unless an accompanying nephritis makes it desirable, diaphoretic drugs should not be employed. Moderate diaphoresis may be secured by suitable clothing, friction, and the maintenance of the proper temperature of the room.

Diuretics are of more service, particularly those that are cardiac stimulants, such as digitalis, caffeine, and strophanthus. The best of these is digitalis; large doses should be given,—10 to 15 drops of the tincture, or 1 to 2 tablespoonfuls of the infusion every three hours. Strophanthus in doses of 5 to 10 drops, or caffein in 2- to 5-grain doses, will be more suitable in other cases, or in any case as an occasional change from digitalis; hydrochlorate of cocaine and of pilocarpine in small doses are each serviceable. The decoction of scoparius is a popular and efficient hydragogue diuretic. It is advan-

tageously combined with an alkaline diuretic such as potassium bicarbonate or bitartrate.

Calomel is one of the best of diuretics. It has the advantage of being sedative to the stomach while most diuretics are irritant. A valuable combination is the old Niemeyer pill—pulv. digitalis, gr. 1; pulv. scillæ, gr. $\frac{1}{2}$; and calomel, gr. $\frac{1}{8}$; given three times a day. This promptly increases the amount of urine and reduces the ascites.

Diuretics do not avail when the accumulation of fluid is excessive, because the renal veins are compressed and the secretory power of the kidney very much impaired.

Formerly active purgation was the corner-stone of the treatment. But since we have come to appreciate both the harmlessness and the efficiency of paracentesis, purgation as well as diuresis and diaphoresis have been relegated to the background. The chronic catarrhal gastro-enteritis that is nearly always present makes repeated active catharsis harmful. Yet the maintenance of a slight degree of laxity is advisable. To this end the laxative mineral waters, Carlsbad, Hunyadi, Freiderichshall, and Apenta water, should be given.

Since dread of opening the abdominal cavity has given place to boldness born of confidence in the safety of the method, we have in paracentesis a simple, efficient, and safe mode of removing an ascites. The measure has much to recommend it—it is harmless; there is not the slightest danger of peritonitis; secondly, when employed early it affords time for the collateral circulation to be established, and therefore frequently gives permanent relief from the symptom. But even if fluid reaccumulates, tapping may be repeatedly practised without evil results. The dangers being therefore traditional and not actual, and a cure being not infrequently obtained, paracentesis should be resorted to early and repeated as often as there is need. When the accumulation has become excessive it becomes an operation of necessity and not one of election. Dislocation of the heart with frequent action, and embarrassed respiration, permit no delay. Indeed, when it becomes necessary for the patient to sit upright in bed,—the condition of orthopnœa,—even without evident interference with the heart, delay is fraught with the greatest danger.

Technique of Paracentesis Abdominis.—The instruments required are simple. An ordinary trocar and canula may be employed. Southey's trocar, or the trocar and canula which Douglass Powell devised, are used if it is thought better to drain gradually. In order to remove the fluid without soiling the patient and bedding a flexible rubber tube may be attached to the trocar to conduct the fluid to a vessel near the bed. The abdomen should be cleaned with an antiseptic solution in accordance with the rules for the performance of any abdominal operation. The bladder should be emptied before the

operation and the patient given a stimulant. The point selected for inserting the trocar should be in the median line, about midway between the umbilicus and symphysis pubis, or about four inches above the latter point. Before the operation the abdomen should be enveloped in a broad bandage, the ends of which have been equally divided into a number of tails, and this bandage held in place by an assistant at the back of the patient. In order to induce gentle, equable pressure over the abdomen and support the abdominal walls, traction on the different portions of the bandage should be made as the fluid flows out; first the tails in the upper portion should be drawn upon, and as the abdomen decreases in size the middle and lower tails should be tightened. When the operation is completed they may be tied at the back or side. In order to prevent pain the skin at the point determined for puncture may be anæsthetized. This may be done with salt and ice, holding them in contact with the skin until it is frozen, or by the ethyl-chlorid spray. It is not to be forgotten that freezing the skin in old people or debilitated subjects may cause serious sloughing; hence in such cases it should be avoided or else great care exercised. During the flow of the fluid the patient often becomes faint, and stimulants should be administered at this time. Sometimes the fluid becomes bloody as it flows out. This should not necessarily cause alarm. If the trocar comes in contact with the intestine, it may cause a little bleeding, or the tearing of adhesions may also be the cause of the flow of blood. Very frequently it occurs at the latter part of the operation, and comes from the wound in the abdominal wall.

Should all the fluid be removed? Probably with the first aspiration, especially if the accumulation has been very great, the entire amount should not be removed at once, but more thorough aspiration done the next day. If, however, no uncomfortable symptoms arise and the fluid is small in amount, it may all be withdrawn with safety. This can be quite well accomplished by the pressure of the bandage on the abdominal walls, aided by pressure of the hands of the assistant in the flanks, and, if necessary, tilting the external end of the trocar upward in order to reach the fluid in the lowest portions. The patient may safely lean forward in order to favor the gravity of the fluid toward the trocar. After removing the trocar, which should be done rapidly, the point of puncture should be covered with borated cotton or an antiseptic dressing held in place by adhesive strips. Some authors advise closing the wound by a stitch if leakage continues after operation, but, as stated above, the writer does not fear any bad results from this leakage, and would let it alone.

In case paracentesis fails, the fluid accumulating rapidly after

each operation, it may be well to resort to laparotomy. There need not be any hesitation in doing this, as recently cases have been cured.

Jaundice.—It is not necessary in this connection to mention the various causes of jaundice, but these must be recognized in every case and the appropriate treatment adopted for their removal. The term jaundice is by metonymy used to indicate the condition of which it is but a symptom. Therefore we speak of the treatment of jaundice and include the treatment of the various toxic symptoms. The most serious effects of the toxæmia are the hemolysis, nephritis, and poisoning of cerebral centres. To rid the blood of the pigment is of the first importance. This is accomplished chiefly by the kidneys, and the therapeutist can do no more than assist their action. The bile is irritant to the renal parenchyma and tends to cause nephritis. Therefore, to assist elimination and to prevent nephritis, large draughts of water, a milk-diet, and diuretics, such as alkalies, scoparius, or digitalis, should be employed. If the urine becomes diminished, cupping in the lumbar region and a hot pack will relieve the congestion and may avert a nephritis.

The hemolysis cannot be influenced by treatment. But the hæmoglobinæmia that develops recovers spontaneously after the toxæmia is relieved. The effect of the toxæmia on the cerebrum is manifested by mental sluggishness, irritability, or melancholia. These symptoms demand an earnest effort to secure increased elimination through kidneys and skin. A more severe group of toxic symptoms sometimes follows, namely, coma, delirium, and convulsions. Free elimination here again is of primary importance. Probably intravenous saline transfusions offer the most hope in this grave condition. They dilute the blood and increase elimination.

Itching is a symptom of jaundice that urgently demands relief. Warm baths, sponging with hot water or with warm sodium bicarbonate solution (one ounce to the pint), a solution of bichloride of mercury (1 : 10,000) or of carbolic acid (10 to 20 drops to a pint of water) often gives relief. Diaphoresis obtained by hot drinks or by pilocarpin (gr. $\frac{1}{2}$ hypodermically) lessens the itching, and should be employed in conjunction with the external applications.

The disturbance of digestion that frequently accompanies jaundice depends on the absence of bile in the intestines. This symptom is present, of course, only in the obstructive jaundice. It is expressed usually as flatulence and constipation. Foods consisting of starch, sugar, or fat should be avoided; fat is not properly emulsified and the starch and sugar undergo fermentation. To combat the fermentation, the intestinal antiseptics should be employed—carbolic acid, naphthol, salol, etc. The purgative effect of bile must be secured by

saline laxatives. In obstructive jaundice no attempt should be made to stimulate the secretion of bile.

Hemorrhages.—The hemorrhage of jaundice is due to lessened coagulability of the blood on account of the diminished number of red blood-cells furnishing fibrin ferment. Wounds should be guarded against and none made voluntarily unless the need of surgical intervention warrants the risk. Bleeding occurs from the nose or fauces, the stomach, and the bowels. Ice-water can be injected into the nose, fauces, or rectum when the bleeding is from these parts. Bits of ice may be swallowed to control gastric hemorrhage, and an ice-bag applied to the epigastrium. If the bleeding point can be reached, antipyrin or tannic acid solution should be applied. The internal administration of gallic acid is advisable.

Vomiting.—This distressing symptom occurs in all hepatic diseases that are accompanied by portal obstruction and congestion of the stomach. It also occurs reflexly from the impaction of gall-stones. In order to prevent vomiting the diet should be carefully selected and the bowels kept open. When it exists nothing but liquids in small quantities should be taken. Milk and lime-water, soda-water, or champagne will be of service. Counter-irritation over the epigastrium—a fly-blister if the vomiting is protracted—does good. The portal congestion may be relieved by enemata or fractional doses of calomel. Saline purgatives produce a freer transudation of serum, but they frequently cause vomiting. Teaspoonful, doses of iced solution of magnesium citrate every ten minutes, however, can often be retained. The persistent retching that attends biliousness is relieved by large draughts of lukewarm water, producing emesis, or by lavage through the stomach-tube. If these means fail, gastric sedatives must be employed. A small dose of calomel and of morphine given dry on the tongue and repeated every half hour often allays the vomiting. Bismuth, oxalate of cerium, cocaine, and creosote are each used with good results in some cases.

Diarrhœa.—This is due to chronic congestion of the intestinal wall or to fermentation of intestinal contents. A milk-diet is advisable in all cases at least for a time. When fermentation exists the intestinal antiseptics are indicated. But more often the chronic catarrh demands astringents, among the best of which are silver nitrate, lead acetate, and the aromatic sulphuric acid. If the stools are small and frequent, and approach the dysenteric type, enteroclysis often gives excellent results. Ice-water may be used for this purpose, or a solution of tannic acid.

Hæmorrhoids.—Surgical treatment should be adopted unless there is protracted jaundice, when the danger of hemorrhage would deter the surgeon. If palliative measures are chosen, two objects

must be kept in mind: first, to keep the anal region scrupulously clean; secondly, to keep the bowels freely open. If the evacuation is had in the recumbent position, there is less tendency to prolapse of the hæmorrhoids. A cold douche following defecation is an astringent and tonic. Sulphur is the most suitable laxative. It may be given in 1- or 2-drachm doses made into a paste with syrup or molasses. Suppositories of iodoform, cocaine, or belladonna relieve the distressing pain.

Biliousness.

Biliousness is a form of auto-intoxication resulting from faulty digestion and perverted function of the liver. Whether the stomach and duodenum or the liver is primarily at fault is not clear. The condition is expressed by a characteristic group of symptoms: headache, languor, and nausea with slight icterus.

If premonitory symptoms, such as slight headache, malaise, and anorexia, exist, the attack may be warded off by restricting the diet and giving a saline purge or calomel. If these symptoms are not relieved and severe headache and vomiting ensue, food must be withheld and the stomach cleaned out by large draughts of lukewarm water. When the onset of symptoms is sudden, teaspoonful-doses of iced citrate of magnesia may be given after the preliminary emptying of the stomach. Then, to relieve the nausea that usually persists, nothing is so good as small doses of morphine and calomel combined (morphine $\frac{1}{32}$ of a grain and calomel $\frac{1}{10}$), the dose to be repeated hourly. After the bowels have been thoroughly cleared out and the stomach emptied the toxic symptoms will rapidly abate.

For a day or two the diet should be of milk or milk diluted with lime-water or carbonated water. The return to the usual diet should be gradual.

During the convalescence, which is usually rapid, the aromatic sulphuric acid in doses of 10 drops before meals aids in restoring tone to the gastro-intestinal tract. It may also be given in small frequently repeated doses during the height of the attack, particularly to those who crave an acid.

When the symptoms of biliousness are less acute a condition exists that has been classically described by Murchison, DaCosta, and others, as chronic lithæmia. Its symptomatology is too protean to admit an adequate description here, but in outline the symptoms are: dyspepsia, furred tongue, constipation, sallow or icteric complexion, pharyngitis, headache, lassitude, and paræsthesiæ. To relieve this condition hygienic measures avail more than drugs. Persons leading sedentary lives are most often affected. Outdoor exercise, preferably horseback-riding, is of primary importance. The diet is to be selected

according to the principles already indicated. Certain drugs are of distinct value. Laxative mineral waters, such as Carlsbad and Hunyadi, taken before breakfast daily, or the phosphate of sodium dissolved in hot water and sipped slowly at bedtime produce marked improvement. Alkalies, as one of the alkaline purgative waters, or sodium bicarbonate with a vegetable purgative, are of much service; the officinal mistura rhei et sodæ in tablespoonful-doses is an eligible method of giving the latter combination. Mineral acids are of decided advantage in chronic lithæmia, particularly if associated with abundant discharge of urates and uric acid. For this purpose nitrohydrochloric or dilute hydrochloric acid given after meals is indicated.

Fatty Liver.

The fatty liver occurs as a part of a general obesity, or as a result of alcoholism, cachexia, profound anæmia, or phthisis. Fatty degeneration occurs only in phosphorus-poisoning and in acute yellow atrophy. When due to the first-mentioned cause the methods of Oertel, Banting, Ebstein, Schwenninger, and others offer hopes of improvement. If it is a result of one of the latter conditions, a cure is to be obtained only by relief of the primary disease, which, of course, is only too frequently impossible. It is probable that the large amounts of cod-liver oil given to cases of tuberculosis increase the fatty infiltration of the liver. Hence the oil should be discontinued if during its administration the liver increases in size.

Active Congestion of the Liver.

Active hyperæmia of the liver is not a definite disease, but a condition usually resulting from gastro-intestinal congestion or the absorption of toxic or stimulating substances from the alimentary canal. It occurs especially in the tropics.

Susceptible persons usually have repeated attacks. They may be prevented by reduction in the amount of food, the avoidance of rich, stimulating foods and alcoholic drinks, and the maintenance of proper intestinal action by some one of the laxative mineral waters. A visit to one of the springs in the temperate zone is of the greatest benefit in the case of one living in the tropics.

For the relief of the acute attack purgatives are valuable. Of these the saline laxatives are the best, mercurials here being unsuitable. Two drugs are supposed to have a specific action; they are ammonium chloride and ipecacuanha. The former is given in doses of 10 grains every two hours until 1 or 2 drachms are taken. The ipecac is used in as large doses as can be given without producing emesis: 15 to 30 or even 40 grains are administered, preceded by 10 drops of deodorized tincture of opium. At the same time the

patient should lie down and a mustard plaster be applied to the epigastrium. The ipecac should be repeated in three hours, and after the second dose relief is usually secured. If not, a third dose may be taken.

The warm bath, hot applications or blisters over liver, or leeches at the anus are measures that frequently give relief.

Chronic Passive Congestion of the Liver.

This condition has a purely mechanical cause. It is due to impeded outflow of blood from the organ, and is due in nearly all cases to insufficiency of the tricuspid valve. The treatment, therefore, is resolved into the treatment of the cardiac disease. A liver the seat of chronic passive congestion eventually becomes cirrhotic with all the symptoms of portal obstruction. These are to be treated according to the principles already laid down.

Amyloid Degeneration of the Liver.

To-day amyloid disease of the liver is comparatively rare. This is due to the fact that modern surgery is able to prevent long-continued suppuration, which is the chief etiological factor. There is no treatment that will directly influence the amyloid deposit in the organ; the process can be stopped only by removing the cause. In the course of amyloid disease of the liver obstinate vomiting and diarrhœa sometimes occur, possibly dependent on the amyloid degeneration of the gastro-intestinal mucous membrane. For the vomiting counter-irritation over the epigastrium may be used, and bismuth and cocaine administered internally. Whether to check the diarrhœa or not is always a problem, because albuminuria is generally present. The use of opiates is dangerous; but bismuth and aromatic sulphuric acid may be used to lessen the frequency of the movements.

Hydatid Cysts of the Liver.

The treatment of hydatid cysts is preventive and curative. The disease is contracted from dogs; hence those who have to do with them should observe the strictest personal cleanliness.

The curative treatment consists of some form of operative procedure. Medicines are useless. Not infrequently the cysts are small and not troublesome. Under such circumstances non-interference may be the best course. But if the cyst is large and troublesome its destruction is imperative. Tapping and free incision are the only measures worthy of consideration, although electrolysis and the injection of irritant fluids, such as iodine solution, have had their advocates. Tapping has the advantage of simplicity, but it is not without danger. It undoubtedly results in cure in many cases; but, on the other hand,

serious accidents have followed its employment. Graham, in his work on hydatid disease in Australia, relates a number of cases that died a short time after tapping, and he also states that after evacuation alarming symptoms, such as vomiting, severe pain, fever, and rapid pulse, ending in recovery, have been observed; these symptoms he attributes, not to peritonitis, but to absorption of the fluid or to reflex disturbances. Suppuration sometimes follows tapping and necessitates eventually an open operation. Exact localization of the cyst is not always possible, and in such cases it is striking in the dark to introduce a canula. In view of these facts the open operation is certainly the most rational method of treatment.

Lindeman is said to have performed the first operation in 1871. He completed the whole operation at one time, while Volkmann operated in two stages. With the present advanced methods of abdominal surgery the former method is preferable. For the details of the operation surgical works should be consulted. The results of direct incision and evacuation of the cyst contents are very satisfactory. In view of which facts the physician who assumes that a certain cyst may safely be let alone is, perhaps, not giving his patient the best chance.

Acute Yellow Atrophy of Liver.

There is no curative treatment of this peculiar affection. The cases almost invariably result fatally entirely uninfluenced by medicine. A few recoveries are reported, and therefore symptomatic treatment is proper for the relief of suffering and because no illness is hopeless until death decides the issue. Pregnancy is a conspicuous predisposing factor in the etiology, and it is barely possible that the induction of labor at the outset of the disease might favor recovery. But the great risk of post-partum hemorrhage should make one hesitate to induce labor unless the coagulability of the blood as determined by clinical experiment were not much impaired.

Suppurative Hepatitis.

Pyæmic, tropic, and amœbic abscesses will be considered together. The former are not curable. The symptoms that accompany the affection alone can be treated. Pain and tenderness are relieved by local application of heat. Stimulants, of course, will be necessary. If a large collection of pus can be recognized, it should be emptied by aspiration. By this means symptoms are relieved and an occasional cure effected. Several collections of pus may be emptied in this way, and a glimmer of hope added to the otherwise hopeless outlook. The treatment of tropic and amœbic abscess may be considered together. The abscesses are usually solitary and arise from

the transference to the liver of infectious material from some point in the portal territory. Persons living in the tropics must lead carefully regulated lives in order to avoid this serious event. Their diet should be light and not stimulating. No alcohol should be used. Exposure to heat followed by chilling is to be avoided. The bowels should never become either constipated or loose. If dysentery develops, earnest effort must be made to cure it promptly. The formation of an abscess is usually preceded by congestion of the liver. On this account all cases of congestion should receive the most careful treatment. This treatment has already been described.

After an abscess has formed the case becomes surgical. Exploratory puncture of the liver is not attended with danger, and should be employed before operation is resorted to, in order to confirm the diagnosis. A long, fine needle attached to the end of the ordinary aspirating-apparatus of Bowditch or Dieulafoy may be used. The puncture should be made at the most prominent or swollen part, particularly if it is œdematous. When on the right side the needle should be thrust upward to the left; and if on the left side, its point should be directed obliquely to the right. The needle should then be withdrawn slowly. If pus is present, a drop or two will be found in the canula or on the point of the needle. The failure to withdraw pus does not necessarily signify the absence of an abscess. Sometimes the material forming the abscess is so thick that it will not become attached to the exploring-needle, or the abscess may not have been reached. Repeated punctures are not harmful, and may be required before the question of abscess is definitely settled. Instead of harm being done, there are quite a number of cases on record in which the symptoms were benefited by puncturing. If pus is obtained, resort should be had to operation. It is not necessary here to describe the operative procedures. In the last few years the surgery of the liver has been greatly improved: peritonitis is avoided by careful stitching of the abscess-wall to the incision, and the danger of hæmorrhage lessened by incising the liver with the thermocautery. With the improved technique the surgical treatment of abscess of the liver is very satisfactory, and operation should be advised in all cases, excepting possibly hepatopulmonary abscess that is discharging freely.

Cirrhosis of the Liver.

No doubt the early stages of this disease are amenable to treatment if the habits of the patient are fully under the control of the physician. In all probability the stage of congestion which is thought to precede an overgrowth of the connective tissue may be removed. Treatment with this end in view is similar to the treatment of congestion of the liver. In addition to regulation of diet and habits,

the use of alkaline, purgative, and diuretic waters is recommended; occasionally local depletion is used. The administration of iodide of potassium is looked upon with favor by some, but it probably does good only in the early syphilitic cirrhosis. Chloride of ammonium, administered in large doses, is also useful, and often the enlarged and congested liver, the first stage of cirrhosis, which is indicated by the habits and associate symptoms, diminishes rapidly when this drug is administered. Some practitioners give small doses of mercury, while others advise external applications of the drug. The green iodide of mercury, administered three times a day in $\frac{1}{2}$-grain doses, appears to act as a resolvent, according to the testimony of some authors, and at the same time relieves the overloaded portal circulation. Pepper used small doses of the bichloride of mercury. Iodoform in small doses for long periods is recommended by Bartholow. A course of waters at Carlsbad or Vichy, at Bedford or Saratoga, with a proper regimen, may relieve the first stage. The course should be repeated annually for a few years.

If the disease has gone on to the stage of proliferation of connective tissue, there are no remedies of any service. The measures resorted to must have for their object diminution of the congestion which is present, thereby avoiding further proliferation of connective tissue. Dietetic means, of course, are necessary to bring this about. The liver must be relieved from the performance of its functions as much as possible, and hence starchy foods, sugars, and fats must be diminished in amount or withdrawn entirely. Stimulants, or highly-seasoned dishes, of course, are not to be allowed. In order to reduce the congestion the portal circulation must be relieved by means of alkaline purgative waters, as Carlsbad, Hunyadi, Friederichshall, and the Saratoga or Bedford water of this country. If after these measures the disease progresses, attention must be paid to the congestion in the portal area, and measures used which will lessen the deleterious results of such congestions in the abdominal viscera. In the earlier sections of this article reference was made to the treatment of these congestions.

The treatment of gastric and intestinal catarrh, the gastro-intestinal hæmorrhages, hæmorrhoids, and ascites, of cirrhosis of the liver has already been described. The condition of the skin and kidneys must, of course, be looked after most carefully. Tonics and measures to keep up the strength of the patient are required. The mineral acids, quinine, nux vomica, and other bitter tonics serve a good purpose, and in the course of the disease may be alternated from time to time. In the later stages of the disease it is necessary to administer stimulants. Prostration is so great and digestion so poor that without stimulating the mucous membrane of the stomach digestion cannot be

carried on, while the prostration, of course, cannot well be relieved by other means. It is necessary, therefore, to relax the regulations regarding the use of alcohol, and spirituous liquors or wines must be ordered. Any one who sees a case through a long period of time will readily understand how necessary it is toward the end to administer stimulants.

In the later stages of hepatic cirrhosis a cachexia develops which requires most careful hygienic treatment. The nutrition of the skin particularly suffers. It should be kept well oiled, as it is liable to become dry and scaly, and bed-sores or low-grade inflammations and ulcers are likely to develop. Pressure-points must be kept dry by powders and stimulated by friction. Cleanliness of the patient must be insisted upon, and local inflammatory areas prevented by proper bedding and clothing.

Syphilitic hepatitis is to be treated in accordance with methods established for the treatment of the later stages of syphilis. The iodides are to be given freely, alternating with or combined with tonic courses of mercury. Tonics are to be used when required. Proper diet is to be selected and general hygiene regulated. But it must be confessed that treatment is curative only during the gummatous stage. After connective tissue has formed it is as far beyond the influence of drugs as is a syphilitic scar on the surface of the body.

Acute Catarrhal Cholangitis.

At the beginning of an attack of acute catarrh of the gall-ducts liquid food that is not stimulating is required. Diluted milk or milk and lime-water, peptonized milk, whey, buttermilk, beef-tea, and animal broths are required. As the attack subsides more solid food may be used. Oysters, white meat of chicken, a finely-minced steak made into a paté, and broiled sweetbread may be used, gradually passing on to other meats, eggs, fish, and easily digested, succulent vegetables.

The patient should be put to bed and kept warm. Warmth should be applied, particularly to the extremities. Mustard plasters, or even more active counter-irritation, to the epigastrium and right hypochondrium are necessary.

Sedatives to relieve vomiting, as in biliousness, are to be used. Calomel or alkaline draughts to secure purgation should be given in the first twenty-four hours. The bile is retained in the liver by a very slight obstacle. The pressure which causes it to pass out in health is very small; if this pressure be increased the plug of mucus or other obstacle in the biliary canal may be removed. An emetic will have this effect. A sufficient dose of ipecacuanha, or $\frac{1}{4}$-grain doses of tartar emetic, given every hour in a large amount of hot

water until emesis is produced, will often relieve the obstructive jaundice.

Drugs which increase the flow of bile and at the same time increase secretions from mucous membranes or dissolve mucus are indicated. Of these, phosphate, bicarbonate, benzoate, and salicylate of sodium are the best. At first the drug which is used may be combined with calomel in small doses, and afterward given alone freely diluted. Alkalies may be given with taraxacum in decoction or in pill or capsule, followed by large amounts of hot water. Chloride of ammonium is another drug of great service: 5 grains every two or three hours, masked by licorice or by simple syrup, may be given. It can also be given in capsule, compressed pill, or cachet. If the bowels have been freely opened and the jaundice does not show signs of disappearing, nitrate of silver may be used. It should be given in pill form and on an empty stomach.

Ipecacuanha in small doses as an hepatic stimulant is advised by many writers. It should be given after the nausea and vomiting of the first period of the attack have passed off: $\frac{1}{4}$ grain every two or three hours is sufficient. It may be combined with nitrate of silver if that drug is given. Hydrastis is much employed in certain parts of this country under similar circumstances. In more protracted cases nitric acid is often of service, and the acid pack over the liver or the general acid bath may be used. The method of Krull has been advocated during the past five years, and the writer has observed some cases that were rapidly relieved by it. From 1 to 4 pints of water, at a temperature of 59° F., are slowly injected into the rectum once daily. It must be retained as long as possible. On subsequent days the temperature of the water is gradually raised until it is injected at 72° F.

Whenever jaundice exists the kidneys are subjected to irritation from the bile pigments and salts and the hæmoglobin resulting from hemolysis; hence diuretics are indicated in every case to prevent renal congestion and nephritis.

It is not to be forgotten that some cases of acute catarrh of the ducts are of malarial origin, and require quinine and arsenic. Catarrhal inflammation of the ducts, if due to syphilis, must be treated accordingly. Often it is of gouty or rheumatic origin, and in such cases Murchison recommends the use of colchicum in addition to alkalies in suitable doses.

Chronic Catarrhal Cholangitis.

The treatment of chronic catarrh of the ducts is similar to that of the acute condition. Attention to the diet and mode of life is essential to success. A saline aperient before breakfast together with gastro-

intestinal tonics are indicated. Ammonium chloride given over long periods may do good. Of more certain value is nitrate of silver. Mineral acids and the acid pack are advised by many, and their use has been followed by cure. All these measures can best be carried out at one of the baths or springs. Marked improvement in these cases is seen at Carlsbad or Saratoga. Even if the chronic catarrh is due to cancer, relief may be obtained in many cases by the measures described. Of course, when the condition is due to gall-stones their removal by surgical or other means is the *sine quâ non* of treatment.

Without the presence of gall-stones, attacks of hepatic colic may occur, due to the passage of ropy mucus through narrow bile-ducts. Relief from these paroxyms may be obtained by hot fomentations, large draughts of hot water producing emesis, anodynes, and antispasmodics.

Suppurative Cholangitis and Cholecystitis.

These two conditions, frequently associated, result in the great majority of cases from the presence of gall-stones. Their treatment is surgical, and need not be dwelt on here. Their cause is, of course, amenable to medical treatment and will be considered below.

Gall-Stones.

A discussion of the treatment of a patient subject to gall-stones must include: first, the treatment of the habit which predisposes to their formation (cholelithiasis); secondly, the treatment of an attack of biliary colic; thirdly, the removal of stones from the ducts or bladder.

In order to prevent the formation of gall-stones, dietetic and other hygienic means are necessary. Fatty and saccharine articles of food, rich food, and malt liquors must be interdicted. Exercise in the open air must be insisted upon, especially such forms as increase the strength of the abdominal and respiratory muscles.

If the patient's occupation is sedentary, he should change his position frequently. Sitting and standing should alternate. In women particularly improper habits of sitting should be corrected, and the wearing of corsets and other tight clothing forbidden. If by reason of some other ailment they have not taken exercise sufficient for the wants of the body that ailment, of course, should be first corrected: this refers more particularly to uterine disease. In many cases it is quite necessary to teach patients how to exercise and to make them appreciate how little exercise they really take. It is surprising how, through force of long habit, many women will be content to keep indoors and, practically, almost in one position.

The bile should be made thinner and its movements through the ducts hastened. To this end large quantities of water should be taken. It should be taken very hot and swallowed slowly and at night. Carlsbad Sprudel salts dissolved in the water, the Vichy or Saratoga salts, phosphate or salicylate of sodium are important and almost essential adjuncts. If the patient is constipated, the above-mentioned salines and alkalies are particularly necessary, and may be used with other purgatives and cholagogues. In order to secure a discharge of bile the characters of which do not favor the formation of calculi, the long-continued use of salicylate of sodium is advised.

For the class of cases under discussion a course at the saline springs is of great advantage. If the patient is careful subsequently, the formation of stones may be permanently prevented. The springs should be selected in accordance with rules previously indicated; suffice it to say that the Carlsbad and Vichy abroad, and the Saratoga and Bedford in this country, are the best. There are excellent grounds, both clinical and experimental, for believing that typhoid fever bears an etiological relation to the formation of gall-stones. The clumps of bacilli commonly found in the bile after this disease act as nuclei about which the calculus develops. Hence it would be a wise precaution after any case of typhoid fever to order a course of sodium salicylate to increase the flow of bile.

Biliary Colic.—The passage of gall-stones always requires medical attention. Pain and collapse, vomiting, and perhaps jaundice are the symptoms demanding relief.

For the pain local applications—poultices, hot cloths, the hot-water bag, and mustard-plasters—are useful. Local depletion is not necessary unless a local inflammation arises. The general hot bath may give great relief through the relaxation it produces, whereby the passage of the stone is favored.

Opiates are generally necessary; morphine may be administered by the mouth or by hypodermic injection. If given hypodermically, atropine may be added to it with great advantage; $\frac{1}{4}$ grain of morphine and $\frac{1}{120}$ grain of atropine in a robust subject will be sufficient. The injection may be repeated in half an hour. The morphine should be given by the mouth in small and frequently-repeated doses unless the pain is excessive. Opium may also be given by the rectum, either by suppository or enema—$\frac{1}{2}$ grain of the extract—and the same dose of belladonna gives relief. Ringer advises gelsemium; 5 drops of the tincture are to be given every fifteen minutes. If the patient walks about, relief may follow sooner.

If the above-mentioned drugs are not sufficient, inhalations of chloroform or ether may be required. Neither of these drugs can be given internally, on account of vomiting.

To relieve the pain and favor the passage of the gall-stone, sipping hot water made alkaline with bicarbonate of sodium may be of advantage.

Vomiting is a most distressing symptom. It may not be relieved until the full effect of the anodyne is produced. Alkaline waters, hot or effervescing, are of advantage. Cracked ice in small pieces may be swallowed, and measures suggested in a preceding section tried.

If the stone does not pass through the common duct—which may be determined by an examination of the stools—it will remain either in the gall-bladder or in one of the ducts. To remove existing stones, solvents, as ether and turpentine, have been used, but their value is doubtful. More can be expected from alkalies and salines when largely diluted and hot, combined with a dietary and exercise like that followed at Carlsbad. It is thought that olive oil, in ½-ounce or 1-ounce doses three or four times a day, will move the calculus. There is some ground for believing that olive oil will disintegrate calculi, but the evidence as yet is scant. Belladonna has been used in small frequently repeated doses to relax the bile-ducts, but the value of the method is doubtful. Massage of the gall-bladder for the purpose of removing stones is mentioned only to be condemned. Osler characterizes it as a "highly irrational procedure," and points out that a stone in the gall-bladder does little harm, while if it be forced into the duct it may cause permanent obstruction.

If by any means, spontaneously or otherwise, the stone becomes fixed and grave symptoms of obstruction arise, surgical measures must be resorted to.

Diseases of the Spleen.

With rare exceptions, affections of the spleen are either secondary disorders or occur conjointly with diseases of other organs. The spleen may be the seat of acute or chronic congestion or inflammation, of infarction, of lardaceous degeneration, of carcinoma, and of hydatid disease. Hypertrophy of the spleen is frequently seen, but is almost always associated with leucocythæmia, the treatment of which is discussed in the article on Diseases of the Blood.

As the affections of the spleen are usually secondary, the reader must look to the appropriate articles for an account of the therapy of particular diseases. It is sufficient to say that the therapeutic management of affections of the spleen is not dissimilar to the management of similar affections in other organs. The removal, if possible, or treatment of the cause is primarily to be attended to. Then hygienic measures or therapeutic methods are to be used which will lessen congestion of the organ; hence congestion or overfulness of

the portal circulation must be removed. Congestions and inflammations, which often result in suppuration, degenerations, and other processes, require local and general treatment applied to such morbid processes.

It may be worth while to remark that in acute affections of the spleen—acute congestion, acute inflammation, and recent infarcts—the organ should be manipulated with the utmost care and as infrequently as possible. Rupture has been known to occur from too careless and energetic palpation.

Acute congestion, present in fever, may require anodynes and local applications to relieve the pain and sense of distention which are present. Depletion locally with cups or leeches, or by saline purgatives, may be required, and the abdomen may be surrounded by a firm bandage to secure support. Acute swelling or acute congestion attendant upon or following malarial disorders is reduced as soon as the causal disease is controlled by quinine, arsenic, etc.

Passive congestion of the spleen due to cardiac disease or secondary to disturbances of the portal circulation requires remedies which control or modify the original disease. In addition to cardiac and vascular tonics, the saline purgatives must be administered cautiously, and mineral waters which relieve congestion are to be taken freely.

If long continued, passive congestion is attended with hypertrophy of the organ, due to overgrowth of the connective tissue. The treatment of such hypertrophy includes: first, the treatment of the cause; secondly, the use of tonics and stimulants; thirdly, salines and other cathartics to deplete the portal circulation; fourthly, the external application of stimulating liniments; and, finally, the use of drugs externally which act as absorbents. The stimulating application most in favor is iodine. It may be used in the form of either the tincture or ointment. The best-known remedy, which has had a long established reputation for its properties in this disease is mercury. Stillé advises that mercury be not administered in cases of enlargement of the spleen which have arisen in the course of hepatic disease. He refers to the pages of Twining, Crane, Vetch, Abercrombie, and others in support of this opinion, and insists that cinchona and iron should be given alone. McLean, who has had a large experience in the hospital at Netley, advises the use of an ointment of biniodide of mercury. The ointment should be rubbed into the skin of the splenic region for about ten minutes; the patient should then be exposed to the heat of a fire. This application may be made daily until the surface is irritated by the ointment, when it must be withheld until the irritation has subsided. Care must be taken to prevent salivation. Some authorities advise the use externally of cloths saturated with dilute nitrohydrochloric acid. The compress

when applied should be kept in place by a broad bandage, and should be changed every two or three days. Recently, injections of various drugs directly into the tissue of the spleen have been advised. Mosler has used, with apparently favorable results, tincture of iodine. Pepper strongly urges the hypodermic use of ergotin or of ergot in the form of the fluid extract. While benefit has been apparently derived from the use of drugs in this way, the writer believes that the hypertrophy, if reducible at all, can be reduced by other and safer means, and that the risks attendant upon injections into the spleen do not warrant their use.

Abscess of the spleen occurs in pyæmia and as a result of the intense inflammation occurring in infectious diseases, particularly typhoid fever and septicæmia. The symptomatic treatment consists in the application of hot fomentations and anodynes to alleviate the pain. But if the patient's condition permit the abscess should be opened and drained as in cases of hepatic abscess.

The result of splenectomy in favorable cases is fairly good. Out of 85 such cases there was a mortality of 35 per cent. It is indicated only in cases of tumor, cyst, wound, or movable spleen. In leukæmia operation has nearly always resulted fatally, there being but one recovery reported. Neither are cases of chronic productive splenitis favorable for operation.

Inflammation of the capsule is to be treated like localized peritonitis in any other portion of the abdomen. Blisters, poultices, and anodynes are required. Chronic inflammation of the spleen with enlargement is to be treated in accordance with the methods described under Passive Congestion.

Hæmorrhagic infarcts are presumably present when with an evident predisposing cause the spleen is found to be enlarged, painful, and the seat of tenderness. Sometimes an indurated area can be discerned on palpation. If these symptoms occur in such diseases as ulcerative endocarditis, there is not much doubt as to the nature of the process. The pain alone will demand relief, and it is to be treated as is the pain in abscess or perisplenitis.

Amyloid disease of the spleen calls for the same general principles of management as are indicated in similar disease of the liver—namely, the removal or mitigation of the cause, the institution of proper hygienic and dietetic regimen, and the use of tonics and of remedies to lessen congestion in the portal circulation.

The treatment of carcinoma and hydatid disease is symptomatic. Tapping may be resorted to in the latter affection, and subsequently the cyst may be opened and drained.

DIARRHŒAL DISEASES AND DYSENTERY.

By W. W. JOHNSTON, M. D.

ACUTE INTESTINAL CATARRH (ACUTE CATARRHAL ENTERITIS; ACUTE DIARRHŒA).

By an acute intestinal catarrh, acute enteritis, or entero-colitis must be understood an inflammation of the mucous membrane from the pyloric orifice to the rectum. The disease may have several varieties as to intensity and involvement of more or less of the intestinal tract. There may be every grade of inflammation from superficial catarrh to that in which there are glandular and lymphatic changes. Such anatomical changes may involve various portions of the intestines, and a study of the symptoms for the localization of the disease is necessary to the proper direction of the treatment. Diarrhœa is not present in all these forms; the only positive symptom of acute intestinal catarrh is the presence of mucus in the stools, whether the movements are diarrhœal or not. Thus the treatment of the disease must vary with the consideration of the etiological factors, predisposing or exciting, and with the intensity and the localization of the lesion.

Some of the predisposing causes that influence the treatment are such as occur in the weak and debilitated, and in old people. Among other predisposing causes are vicissitudes of temperature, extreme heat of summer, poor hygienic surroundings, improper food, impure drinking-water, insufficient clothing, and previous and frequent attacks.

As secondary causes, predisposing to intestinal catarrh, may be mentioned extension of disease, as from gastritis, proctitis, peritonitis; disturbances of the venous circulation; infectious diseases, as epidemic influenza and sepsis; chemical irritants acting through the blood, as urea, or toxic substances absorbed by the skin from extensive burns and eliminated through the biliary secretion.

The most common exciting cause is some error in diet in quality or quantity, more seldom a chemical substance in a concentrated form, as drastics, mercury, phosphorus, or arsenic. More frequently a chemical irritant, formed in the fermentation and decomposition of food and in bacterial growth, is the proximate cause. Thus various

irritating organic acids, ptomaïnes, toxins, and toxalbumins are formed, and set up and maintain a functional disturbance of the proper mechanism of the intestine. That these new chemical poisons —toxins—are sufficient to cause as well as to sustain irritation of the intestine, is shown by the erythema produced on the nates from contact of the diarrhœal discharges.

Treatment.

Prophylactic Treatment.—A change of climate to the mountains or the seashore before the beginning of hot weather is the most efficient precaution that can be taken by those predisposed to diarrhœa from previous attacks, old age, long-continued disease, and general debilitating influences. This precaution is particularly applicable in the case of infants and children.

One attack predisposes to a second, so that a strict hygienic and dietetic treatment, to be continued for at least one year, is to be enforced. The avoidance of intemperance in the quality and quantity of food and of imprudent exposure to wet and to sudden changes of temperature are all-important. The knowledge of the habits of every individual patient is of service in formulating advice as to diet, clothing, mode of living, etc.

General Rules of Treatment derived from a Knowledge of the Etiology of the Disease.—Where the cause is the ingestion of improper and indigestible foods followed by paroxysmal pains, and infrequent, small stools, a cathartic, as castor-oil, or calomel gr. ij–v, sodium bicarb. gr. ij–v, is to be given to expel the foreign substance, and thus lessen fermentation and putrefactive changes, and stop further injury to the delicate mucous lining of the intestine.

All the forms of acute intestinal catarrh have a certain varying amount of gaseous formation, as shown by the tympanites and borborygmi, whose origin is explained by the fact that fermentation and putrefactive changes are occurring as a result of bacterial multiplication. From the knowledge of this condition has arisen the effort to bring about intestinal antisepsis, but it cannot be assumed that it is possible, by any known method, to make the intestine perfectly free from germs. The utmost that can be hoped for is to diminish putrefactive changes, and thus to remove a source of local irritation as well as of general infection.

In the cases where putrefactive action is indicated by the formation of gas, acid reaction of the fæces, and increase of indican in the urine with sulphuric ether compounds, with marked increase of bacteria in the stools, the administration of intestinal antiseptics, combined with or followed by a cathartic, is the nearest approach to

disinfection that can be obtained. The requirements of an antiseptic employed are that it should be non-poisonous, insoluble in the stomach and very soluble in the intestine, and if possible it should emulsify with the fats and still retain its antiseptic properties; and the dose should be large and frequently administered. This is to be followed by a cathartic and strictly sterilized food, given during the period of illness. The antiseptic remedies used are principally bismuth salicylate gr. i–xv, every two to three hours, calomel gr. $\frac{1}{8}$–$\frac{1}{6}$ given every hour for five doses, bismuth subnitrate gr. x–xv–xxx, and salol gr. v. Benzo-naphthol, gr. viij, in four powders, followed by occasional doses of calomel sufficient to purge slightly, has good results in many cases. The following formula may be used:

℞. Benzo-naphthol., gr. ij (0.10);
Bismuthi salicylatis, gr. v (0.30);
Resorcin., gr. ij (0.10).
M. et. ft. in pulv. j.
Sig. One every three hours.

Followed by calomel gr. v with sodium bicarb. gr. v.

Resorcin, creasote, and salicylic acid have been advocated as antiseptics. Beta-naphthol was warmly praised by Bouchard, as it quickly and effectually deodorized the stools, but is open to objection, as it is irritant to the stomach and reduces the secretion of hydrochloric acid. Benzo-naphthol is non-irritant and does not impair the gastric secretions, yet has all the qualities of the antiseptic action of beta-naphthol, and is therefore preferable. It may be given in doses of gr. iss–viij in powders, repeated every two or three hours.

Tanningen or diacetyltannin—gr. iv–xv, three times a day—is insoluble in the stomach; tannic acid is set free where the reaction is alkaline, and thus the active agent is brought in direct contact with the surface to be influenced.

Hayem recommends lactic acid in the form of a lemonade, composed of $\frac{1}{2}$ ounce of lactic acid, 7 ounces of simple syrup, and 20 ounces of water.

The most rational method of antisepsis is abstinence from food; after this a diet of boiled or sterilized milk in small quantities is effective. This object can be aided by antiseptic irrigations, by which the foreign substances are washed away, meteorism reduced, and the bacteria made less active, leaving a clean surface of mucous membrane. The following antiseptics may be used in this manner in the strength indicated:

				Grammes.
Boric acid	ʒiss–ij	to the pint		(6.–8. to 500).
Creolin	gr. iv–viij	"	"	(0.25–0.50 to 500).
Thymol	gr. iv–viij	"	"	(0.25–0.50 to 500).
Tannic acid	gr. xxx–lx	"	"	(2.–4. to 500).
Salicylic acid	gr. xv	"	"	(1. to 500).
Naphthol	gr. iss–ij	"	"	(0.09–0.12 to 500).
Potassium permanganate	gr. iss–v	"	"	(0.09–0.30 to 500).
Carbolic acid	gr. v–x	"	"	(0.30–0.60 to 500).

The first in the list is the safest and the last the least safe. Mercuric chloride is dangerous in any strength, and nitrate of silver is more adapted to the chronic form, particularly when ulcerations exist. Formalin, 1 : 10,000, has been used, but stronger solutions have proved too irritating to the bowel.

The irrigations should be continued twice daily. Should there be a lessening in the number of stools, in putridity, meteorism, and the amount of mucus, it is an indication for lengthening the intervals of treatment.

Treatment of Clinical Varieties.—I. DUODENITIS.—Acute catarrh of the duodenum follows and accompanies acute gastric catarrh, and is also a part of acute general intestinal catarrh. The only positive evidence of its existence is the development of icterus after an attack of acute indigestion. The other symptoms of duodenitis are distress in the duodenal region after eating; the stools have a penetrative odor, contain unaltered fats and bile, and show an intimate admixture of mucus with fæcal matter. A diet that does not contain starches or fats, and is light and easy of digestion, patiently continued for some time, will cure the duodenal catarrh, although the icterus may persist for weeks longer, as this is due to secondary catarrh of the bile-ducts, which is much more slowly relieved.

II. GENERAL INTESTINAL CATARRH.—This form involves both small and large intestines, and is the one most commonly met with. If the lesion in the small intestine is more marked, the mucus is intimately mixed with bile-stained and fluid fæcal matter; if the colon is the chief seat of lesion, the mucus is in distinct masses or shreds, or mucus may be passed without fæces. General intestinal catarrh can be divided clinically into several varieties, namely: 1, mild forms; 2, moderately severe and severe forms; 3, choleraic form.

1. *Mild Form.*—Even in the mildest form, when diarrhœa exists without fever, rest combined with fluid diet and the avoidance of solid food for twenty-four or forty-eight hours will shorten the attack and result in cure in a few days. Milk is most suitable in all cases, with the addition of lime-water, or diluted one-third with barley-water or

Vichy water. After the first twenty-four hours the patient may take light beef-tea or thin broths. After the diarrhœa subsides we may give soups, soft solids, milk toast, the farinacea, or a soft-boiled egg, gradually increasing to a solid diet. Should the diarrhœa continue and be accompanied with slight pain, bismuth subnitrate or salicylate may be given, combined with opium to lessen the number of stools and relieve pain, but not in doses sufficient to stop the movements too quickly.

2. *Moderately Severe and Severe Forms.*—When the attack is more severe, attended with fever and with colicky pains and tenesmus, borborygmi, distention, and diarrhœal dejections that are soft, watery, and frothy from gases, the patient should be kept in bed and not allowed to rise to stool. Hot fomentations or sinapisms may be applied to the abdomen for the relief of the pain; afterward a flannel binder should be worn. Food should be abstained from during the first twenty-four or forty-eight hours, and small quantities of barley-water, rice-water, or white-of-egg-water given to relieve thirst. Then, after a day or two, milk may be given and persisted in until the diarrhœa has ceased; or, if pure milk is not tolerated, it should be diluted one-half with barley-water or rice-water. Expressed beef-juice may be given instead of milk, in small quantities at short intervals.

Internally bismuth subnitrate, gr. v–xx, with Dover's powder, gr. ii–v, or 5 to 8 drops of the deodorized tincture of opium, may be prescribed to check the diarrhœa; or morphine, gr. $\frac{1}{8}$–$\frac{1}{6}$, may be given hypodermically, to produce rest and relieve pain. Opiates should be cautiously used in doses sufficient to lessen the number of the stools gradually: too large doses would arrest perisistalsis and thus increase the colic, fever, and catarrh. In case of nausea and vomiting the opiates may be given by enema, as tinctura opii, gtt. x, normal salt solution ℥ij; or in suppositories, morphia gr. $\frac{1}{4}$, ext. belladonnæ gr. $\frac{1}{4}$, ol. theobromæ q. s.

Although the symptoms may cease after this course of treatment, the catarrh may still persist and the normal anatomical condition of the mucous membrane of the intestine may not be restored; a strict liquid diet is still to be continued, gradually adding, as improvement takes place, broths, soups, beef-tea, sweetbreads, meat jellies, and other solids of easy digestion. Cold water is to be avoided, as are also fruits, fatty, farinaceous, and acid foods.

The seat of this form is chiefly in the ileum and colon—ileocolitis—rarely in the ileum alone. If in the ileum alone, there may be no diarrhœa, but the presence of mucus disseminated in the dejecta as small hyaline mucous particles, with indican in the urine, are diagnostic indications. The same treatment is called for in this class

of cases. Rectal irrigations, as suggested in the article on Dysentery, are advisable in this form, especially if the stools are putrid.

3. *Choleraic Form.*—Should the case be more severe, symptoms of collapse being imminent, as pinched expression of the face, emaciation, accelerated and small pulse, cool skin, cold sweats, cramps in the extremities, etc., with frequent liquid stools without color or odor, with much or little mucus, numbering twelve to twenty-four in twenty-four hours, accompanied or not with pain, tympanites, and tenesmus, the patient should have absolute rest in bed, not being allowed to rise to stool; external heat is to be applied to the abdomen and body, a hot mustard foot-bath given, with hypodermic injection of morphine, gr. $\frac{1}{4}$, to stop the purging. If the patient be exhausted and cyanosed, hypodermoclysis or intravenous injection of normal salt solution (6 : 1000), one pint, should be given, also stimulants hypodermically and small quantities of iced cognac by the mouth. After the subsidence of the most dangerous symptoms, when the patient gradually recovers from the collapse, the free administration of water is first called for. Milk diluted is peculiarly efficacious in such cases, and the reason is no doubt to be found in the fact that it diminishes the number of bacteria in the intestine. Gilbert and Dominici have discovered that in men and the lower animals an exclusive milk diet will reduce the bacteria in the fæces to one-seventh of the normal. No solid food should be allowed until the stools are normal in character, milk being given exclusively.

The medicines used are principally bismuth subnitrate and opiates to relieve pain and reduce the number of stools.

In this as in the previous form, rectal irrigation with the antiseptics used for the purpose, as mentioned above, is of special service in reducing and aiding in the expulsion of the toxic substances formed in the intestinal canal, although in the acute stage the patient is usually too ill to permit of this treatment. The locality of this form of the disease is in the ileum and colon—chiefly the colon—where the irrigations may be used with benefit, as they come in direct contact with the diseased portion of the bowel.

For the collapse, besides the restoration of water to the blood by intravenous and subcutaneous injection, it may be required to sustain the heart action with nitro-glycerin, strychnine, and whiskey administered hypodermically.

In infants and children acute intestinal catarrh is chiefly found in the ileum and colon, and is designated as ileo-colitis. The lesions are much the same as occur in the adult, and the duration of the illness depends upon the nature and extent of the process. The general prophylactic treatment, hygiene and diet, should be applied here as

with the adult; the peculiarities to which children are prone, however, make certain special rules necessary.

From an etiological standpoint, the only way to the prevention of the disease is in change of climate, especially in the summer months, and many lives may be saved by timely insistence on this point. Sufficient clothing, cleanliness of the body by bathing, changing of napkins, and washing of nipples and bottles, will lessen the number of cases. It is important to give infants and young children sterilized milk; this should be given at intervals, during the day, of every two to three hours, with no food from 10 P. M. until 6 A. M.; in older children no food should be allowed from 7 P. M. to 7.30 A. M., in order to give the stomach and intestine the proper amount of rest. Regulation of the quantity and quality of the food, bathing, fresh air, and sleep will add a great deal to the health of the child. Overfeeding should be avoided; the presence in the stools of masses of undigested casein or the frequent vomiting of milk are evidences that, for the time being at least, the food is in excess.

In mild cases, when there is diarrhœa with vomiting and a slight rise in temperature, avoidance of all food for the first twenty-four hours is imperative; after which barley- or rice- or albumin-water, or wine whey may be given in small quantities, increasing the amount when improvement takes place. Later diluted milk may be cautiously tried. If this treatment does not suffice, bismuth subnitrate, in doses suited to the age, should be given every two or three hours, and irrigation of the colon practised two or three times daily with a mild antiseptic or astringent.

When the case is very acute, associated with prostration and frequent liquid stools, which contain mucus, blood, or pus, absolute rest, combined, with careful feeding and with brandy or whiskey for the needed stimulation, hot fomentations to the abdomen, crushed ice to relieve thirst, and antiseptics by the mouth or by rectal irrigation, are the measures to be employed.

When the child recovers sufficiently from the diarrhœa and accompanying symptoms, proper feeding at regular intervals is the principal matter for the physician's attention, and his directions should be clear and precise, covering two weeks at least. Occasional irrigations of the colon once daily may be continued until the stools are normal and free from mucus.

The diet should be made a special study in children prone to such attacks, and the stools subjected to repeated examination in order to detect any fault in digestion.

CHRONIC INTESTINAL CATARRH (CHRONIC CATARRHAL ENTERITIS; CHRONIC DIARRHŒA).

In the treatment of chronic intestinal catarrh with chronic diarrhœa much is dependent upon the stage and degree of the chronicity and upon the predisposing and exciting causes. It may be a distinct and primary disease or, as most commonly occurs, it is a sequel to frequent attacks of acute intestinal catarrh. The anatomical changes of the intestinal wall may involve all the coats; an atrophic or hypertrophic condition of the mucous membrane may exist, and, with the other organic changes that follow a long-continued catarrh, there would be no possibility of securing by treatment a return of the structures to a normal condition. Nothnagel found in 80 per cent. of his cases an atrophic condition of the mucous membrane. Jürgensen, Blaschko, Sakaki, and others found changes in the nervous system, involving particularly the plexuses of Meissner and Auerbach.

In cases where destruction of the epithelial lining takes place auto-intoxication may result from absorption of the products of fermentation. If the absorbed toxins, toxalbumins, aromatic substances, and ptomaïnes be in excess of what can be gotten rid of by the liver and excreted by the kidney, a number of varied symptoms occur, as nausea, eructation, vomiting, diarrhœa, colic, headaches, vertigo, insomnia, irritability, and depression of spirits. A reduced secretion of bile also predisposes to the increase of decomposition-products.

The presence of mucus in the stools is a positive indication of this pathological condition, and is found either within the fæcal masses or coating them, according to the location of the lesion.

Treatment.

The best means for treating these morbid processes is a strict regimen of diet suited to the individual's capacity; and without the ready concurrence of the patient in this treatment it is useless to attempt a cure.

When the disease is due to long-continued, passive congestion of the portal vein, as in cardiac, pulmonary, hepatic, and nephritic diseases, or from debilitating disease, as tuberculosis, or as a sequel to typhoid fever or dysentery, the treatment should be such as the individual case demands.

There are three forms of the disease that require somewhat different forms of treatment. It may be characterized (1) by constipation, with the presence of varying amounts of mucus in the stools; (2) by occasional and recurring attacks of diarrhœa from catching cold or imprudence in diet; or (3) by constant diarrhœa.

(1) *Constipation* occurs most often in these cases, and is the rule

in chronic catarrh of the colon, due probably to a reduced or lowered function of the nervous system of the intestine caused by inflammation, and to increased density of the fæcal mass from deficient secretion. In this form the stools are composed of dry, dark, and crumbled scybala, or they may appear normal, covered externally with tenacious mucus or even with pus should there be follicular ulceration. The symptoms are abdominal distention, borborygmi, uneasiness and distress in the abdomen after eating, occasional cutting pains which subside after a movement, vertigo, and præcordial distress, and increase of sulphuric ether substances in the urine, all due chiefly to fermentative decomposition and absorption. The treatment is principally by diet and intestinal antisepsis, combined with cathartics. Care as to proper hygiene, removal of any debilitating influences, as care and mental anxiety, advice against imprudent eating and drinking and other dissipations are necessary parts of treatment.

In these cases climatic treatment in a mountain region is better than at the seashore, high altitudes in a temperate or southern climate in winter being most desirable. Mental rest and diversion from all home and business cares may aid in the cure if continued for from several months to a year. Especially in cases complicated with hypochondriasis, melancholia, or neurasthenia, which are not rarely met with, is a prolonged residence in the mountains to be recommended in order to prove of permanent benefit. Moderate exercise, especially on horseback, massage, light gymnastics, and warm baths with friction are advisable. The habit of going to stool at a regular hour every day is to be urged, and the stooping posture is much to be preferred to the seated position of the ordinary closet. A return to the primitive methods of defæcation is often curative; cases of chronic constipation may in some instances be entirely relieved by the adoption of this suggestion, without resort to laxatives.

This condition is frequently accompanied by a decrease of the proper biliary and pancreatic secretions, so that the diet prescribed must be of easy digestion: this should take place chiefly in the stomach, leaving a minimum amount of intestinal work. Regularity in eating and the proper mastication of food are of the first importance. Preferred articles of food are: rare, scraped beef, toasted bread, beef-essences, cocoa, light soups, boiled chicken, white meat of game, milk, which if not tolerated should be boiled, soft-boiled and raw eggs, koumyss, sweetbreads, and oysters. If the case be an obstinate one, the diet should be restricted to fluids, returning to solids gradually as the condition improves. The patient should avoid cold drinks, acid or sweet foods, puddings, fats, pastry, and starchy foods, most vegetables and fruits either cooked or raw. Any unobjectionable

mineral waters may be suggested, as they are both diuretic and diaphoretic, and, as a purgative is often required, the Bedford, Hunyadi, or Carlsbad waters may be used.

The medicinal treatment may be directed first to aid digestion, with pepsin and hydrochloric acid given after meals so as to diminish the work of the intestine. For constipation the various cathartics, as calomel, cascara, aloin, or podophyllin with belladonna and strychnine, can be given. It may be necessary to use enemata; these given in small quantities and at the same hour every day, will in time reestablish the habit of defæcation.

(2) Frequently *constipation* and *diarrhœa* alternate, the result of the irritation of the intestinal nerves by scybala and by the decomposing microbic products formed during constipation, or of slight changes in temperature, and indiscretions in diet. Care as to diet and clothing and the avoidance of cold or wet, will be needed for the relief or cure of this form of the disease. The stools are at first formed and covered with tenacious mucus, afterward they are fluid and bile-stained. This class of cases often suffer with meteorism, pain, and nervous symptoms which abate after regular evacuations of the bowels. The general condition of these patients may be excellent for years, and only after imprudent exposure and taking cold does diarrhœa begin; this soon ceases after proper care as to hygiene and diet. Besides rest and diet and other measures to aid digestion and improve the general health, various intestinal antiseptics, as bismuth salicylate, salol, benzo-naphthol or resorcin, should be prescribed where the symptoms of intestinal fermentation exist.

(3) *Diarrhœa* may be the chief symptom: there may be one or two stools every day of watery or semi-solid consistency; or frequent diarrhœal stools containing undigested food, mucus, and bile-pigments. When borborygmi, persistent flatulency, and pain are frequent symptoms, milk diet should be persevered in for several weeks, and solid food, starches, and fats avoided; hot fomentations and rest in bed may be necessary to relieve the pain.

Efforts are needed to improve nutrition by regulating the life of the individual, by careful exercise, strict diet, baths, massage, and appropriate change of climate. Sometimes partial or complete rest may be resorted to in order to check the continual drain of fluids. Opium, the routine use of which is to be condemned, is our only valuable remedy for intense pain, but should not be long continued. When the diarrhœa is checked by this treatment the disease is by no means cured, and the *restitutio in integrum* is only obtained by continuing liquid food. Milk should be the principal article of food; alternating with this, koumyss, butter-milk or beef-juice may be used. Return to solid food should be delayed until some benefit is assured;

after continual improvement for a month the most digestible foods may be added to this list, such as scraped and finely minced beef, raw or slightly cooked; soft-boiled eggs and oysters, each being added gradually to the dietary and its effect watched carefully. Disappointment in the treatment usually results from a too early return to mixed diet after the cessation of the diarrhœa.

Internal medication is of little value, yet various antiseptic remedies may be given to prevent fermentative decomposition, such as bismuth salicylate, benzo-naphthol, lactic acid, and salol.

As the usual seat of the disease is the colon, much is to be expected from irrigation of the rectum and colon with astringents and antiseptics, as mentioned in the article on Acute Intestinal Catarrh. The method of irrigation is the same as described and employed in the article on Dysentery. Tannic acid, boric acid, zinc sulphate, and alum may be employed in this way in the strength of from 1 to 2 : 500. These should be used two or three times daily; the antiseptics are to be preferred to the astringent remedies mentioned.

Stimulants may be needed in some cases, especially in old people or in those having a sluggish circulation from organic disease. Strychnine and alcohol are the best forms of stimulant.

When the inflammatory process ends in follicular ulceration—as recognized by emaciation, debility, anæmia, diarrhœal stools containing mucus, blood, and pus, with shreds of mucous membrane—everything should be done to improve and maintain the general nutrition with the aid of local treatment by irrigation of the lower bowel with antiseptics. The milder agents, as boric acid, are the best; silver nitrate, gr. viij to Oj, is especially suited for cases in which the ulceration is clearly the lesion.

In chronic duodenitis and chronic ileitis, the dietetic plan of treatment is most important. Foods most easy of digestion by the stomach, and the avoidance of fats and starches, are to be prescribed in order to minimize the work of the intestinal digestion.

In colitis the methods and remedies mentioned for irrigation are most appropriate and effective.

There is another form in which the marked symptom is the expulsion of membranous-like masses of mucus of various shapes and forms, some being moulds of the intestine. This is most often associated with neurasthenia and atonic dyspepsia, so that it may be said to be a symptom of disorder of the nervous system. It is sometimes found in association with floating kidney. The treatment in such cases would be to influence the mind of the patient by removing depressing influences, change of climate and residence to the mountains, camping out, exercise, electricity, special nutritious diet, tonics and aids to digestion are all necessary to influence this condition.

Sometimes rest treatment is of more benefit and, with attention to digestion, is all that is needed. Uterine and ovarian disorders should be remedied. This form of the disease, mucous colitis, occurs more frequently in women than in men and between the ages of forty and fifty years. When there is constipation, the use of mild laxatives, as aloin, podophyllin combined with belladonna and strychnine, are to be preferred to drastic cathartics or salines. Water should be taken early in the morning and during the day, and a habit of going to stool regularly every day should be established.

ACUTE DYSENTERY.

More or less chaos exists at the present time on the subject of dysentery. The former symptomatic classification has been unsettled by the proved connection between the tropical form of the disease and the amœba coli; but as no parasite is uniformly found in the sporadic disease with so-called "dysenteric" symptoms, it is not possible to class all such cases under one specific form, or even to assert that they are all due to a specific cause. It is probable that there are various forms of dysentery from different micro-organisms, and there may be a non-specific form due to "catching cold" or to the presence of indurated fæces or foreign bodies, but on these points there is still much uncertainty. Fortunately the treatment that aims at destroying micro-organisms in the colon and rectum is so successful that, for the present, as far as the therapeutics of the disease goes, we may regard all cases as local infections to be treated as such.

The disease has its seat in the colon and rectum, where inflammatory changes occur involving the mucous lining, the tubular and solitary glands. Accordingly the symptoms are those of a very acute colitis, characterized by frequent stools with the discharge of blood, mucus, and pus, and accompanied with fever. Thus, in the treatment of the disease, accepting the microbic theory, the tendency is to apply the principle of asepsis and antisepsis, using remedies and methods that cause destruction or retard the further development of micro-organisms in the colon and rectum. The older empirical or symptomatic methods are ceasing to be employed unless consistent with the prevailing views of the pathology and pathogenesis of the disease.

An attack of acute dysentery may begin with premonitory distress in the abdomen, occasional chills, and a feeling of general malaise; then follow the characteristic symptoms that mark the disease—namely, fever with more or less prostration, tormina, tenesmus both rectal and vesical, and mucus and bloody stools. A mild case may last from a week to ten days and have slight fever, tenesmus, and burning in the

rectum, with frequent evacuations of blood-stained mucus. In the more severe form these symptoms are intensified, the stools becoming bloody or purulent, containing membranous flakes or shreds, or even moulds of the large intestine; there are vomiting and thirst, tympanites, tenesmus, and tormina, great exhaustion and profuse sweating, with delirium, the illness lasting two, three, or four weeks. The treatment must take into account the gravity of the case, measured by the height of the fever, the strength of the heart-beat, and the state of the circulation, the degree of prostration, and the character and frequency of the stools. When the stools are involuntary, painless, and fœtid, containing membranous shreds and pus, there is a more serious pathological process than when they simply consist of mucus, pure or blood-stained. Consideration as to the locality of the lesion, the presence of ulcers, putrid decomposition in the bowel and possible auto-infection from this source, and the probable existence of a micro-organism in the intestine as the cause of the disease, must be taken into account when prescribing for these cases.

Treatment.

The preventive measures applicable to the treatment of dysentery are in common the same as those conducive to good health in general. Where there is a damp soil, imperfect drainage, overcrowding such as occurs in public institutions, imperfect ventilation, impure drinking-water, careless disposal of the excreta—conditions that are prejudicial to health and favorable to the invasion of the disease, the rules are plain as to what should be done to prevent the outbreak of dysentery, especially in an epidemic form. When an epidemic does occur, attention should be paid to public and individual hygiene: the disinfection of the excreta and the securing of pure drinking-water are essential. All drinking-water should be filtered and boiled, regardless of its source.

At the onset of the disease the patient should be put to bed and have absolute rest, and the bed-pan should be used from the first. The bed-covering should be sufficient to keep the feet and surface warm and to prevent chilling; good ventilation, strict cleanliness as regards the disinfection of the stools, clean bed-clothing and washing of the anal region with antiseptic lotions of carbolic acid, lysol, or creolin, after evacuation, should be insisted on from the beginning. Hot fomentations and poultices to the abdomen may give the patient a feeling of comfort and aid in relieving pain. The use of ice locally over the region of the colon would seem to be a rational means of reducing the intense hyperæmia of the earlier stages, but it has not been much advocated. Without early treatment the mildest case may take on a severe course and the intensity of the symptoms may

increase from the destruction of tissues by necrosis and from the absorption of decomposition-products of microbic origin.

Diet.—Errors in diet, improperly digested food, and the fermentation and decomposition resulting therefrom, add much to the danger and to the gravity of the symptoms. Concentrated foods, easily digested in the stomach, as broths or beef-essence in small quantities, with rice-water and barley-water to relieve thirst, are best suited to these cases. Milk is sometimes not well borne, and the presence of casein in the stools will be an indication for its discontinuance. If milk be given, it should be diluted one-third or one-half with lime-water, barley-water, rice-water, or Vichy water, or it may be sterilized or peptonized. It should be given in quantities of from 2 to 4 ounces every two or three hours. There should never be any overloading of the intestinal tract with food, as it is difficult to get perfect digestion; moreover the increase of the waste products would add to the irritation and to the possibility of auto-infection from any decomposition that may arise. Enough food should be given to maintain the strength of the patient, and as improvement takes place, recognized by the change in character of the stools and relief of pain, the quantity may be increased. Solid food should be withheld for some time, as increased peristalsis and additional waste products may cause the reopening of the healing ulcers.

Laxatives.—The use of laxatives is rational as applied to the disinfection of the intestinal canal, by removing contents that irritate mechanically, and which, by their retention, pave the way for putrefactive changes. The treatment of a case may well be begun by the use of a saline laxative, as magnesium sulphate, sodium sulphate, sodium and potassium tartrate, or castor oil, especially when the stools are small and composed of scybala coated with mucus and blood. In children the use of calomel is to be preferred, especially when vomiting occurs. There must be sufficient dosage to obtain free watery movements with the least amount of irritation, as increase of peristalsis will, to a certain extent, be harmful to the already actively inflamed intestine. Where the stools are copious and fluid the use of purgatives, as a "method," may do much harm. If daily irrigation of the bowel is employed, there is rarely a necessity for repeating a cathartic, as the bowel is thus kept clean of any accumulation of fæcal matter and of decomposing fluids. If constipation sets in after the subsidence of the acute inflammation, a cathartic is necessary.

Opium.—Opium, if needed to diminish peristalsis and pain, should be given in small doses, but never in doses sufficient to arrest the movements completely or to check them too suddenly; a most sudden and even fatal collapse may follow the breaking of this rule. Especially is it to be remembered that opium is not to be given where the stools

are liquid and putrid, as such accumulations are much better expelled. The use of irrigations of the lower bowel, as will be spoken of hereafter, will remove any danger of absorption of toxic substances and also lessen the number of stools. When there is intense pain and insomnia, opium is of great value, and is best given in the form of morphine hypodermically; in this way its effects can be better regulated. It may also be given in the form of Dover's powder or deodorized tincture of opium. These should be given in small doses at safe intervals, and the effects must be carefully watched so as to avoid all risk of narcosis.

Ipecacuanha has for a long time been held especially efficacious in cases with high temperature and intense tenesmus. Large doses of this drug are recommended by the Anglo-Indian physicians, but it has never met with favor in this country; some benefit is claimed for it when administered in quarter-grain doses every half-hour. No curative action can be looked for from its use, and even the most enthusiastic supporters have less reliance in its action than formerly. Astringents are without effect and are harmful in that they derange digestion.

Large doses of **bismuth subnitrate** every three hours have had beneficial effects at the hands of some physicians.

Intestinal antiseptics, as magnesium salicylate, bismuth salicylate, gr. x–xv, benzo-naphthol, gr. v–x, or salol, gr. iij–v, may be used to assist in the disinfection of the canal, particularly where meteorism from decomposition is present. Calomel given in small doses and at short intervals has the combined action of an antiseptic and mild cathartic; Dover's powder may sometimes be given advantageously during the course of the administration of calomel; it will relieve griping and prevent a too active cathartic action. This treatment should be continued several days to be of any benefit. Corrosive sublimate in small doses, from gr. $\frac{1}{120}$ to $\frac{1}{60}$ every hour, has been employed for the same purpose.

Local Treatment of the Rectum and Colon by Suppositories, Injection, and Irrigation.—The ancients washed out the bowel for the removal of "acrid humors" which they thought intensified the inflammation. Pathological research at the present day shows us that the ancients were right, and that if we could keep the bowel thoroughly clean and aseptic, as we do an external wound, we would be better able to cure dysentery.

In 1826 Joseph Kent used cold-water injection, and O'Beirne first used the long gum-elastic tube, "to give exit to the accumulated and pent-up contents of the cæcum and colon." Hare, in 1849, said that the use of a long tube was like changing a huge internal abscess to an external one and enabled us to wash out and cleanse it from its

putrid contents He also stated that by getting rid of the acrid secretions resulting from sloughing ulceration, the use of local applications would diminish the terrors of dysentery. He also advised frequent repetitions of the process of cleansing whether the stools were solid or liquid.

As far back as 1774, the theory of antiseptic treatment was accepted. Peruvian bark, chamomile-flowers, calumba, charcoal, calcium chlorate, sodium hyposulphite, creasote, and other similar substances were necessarily employed. In 1879 Cantani recommended the local use of carbolic acid, sodium salicylate, sodium biborate, etc. for the disinfection of the colon in dysentery and prophesied good results from this form of treatment.

A number of reports since then have confirmed this prediction, and the plan, in some form or other, has come into use in all countries.

Various methods have been adopted, all of which have the same end in view, being designed to act locally upon the inflamed surface:

1. Treatment by suppositories and by small injections.

2. Treatment by large injections which are retained and are passed by the voluntary effort of the patient.

3. Treatment by lavage with large quantities of fluid, the immediate escape of the fluid being provided for.

1. *Suppositories.*—It is plainly seen that in the use of suppositories containing astringents the action is purely local and is probably at most only applicable in rectitis. Suppositories containing opium or morphine may be beneficial in relieving the tenesmus. When used in this way the rectum should be first irrigated and cleansed of mucus. Antiseptic remedies may be used in suppositories alone or combined with opium. Cocaine has been used in suppository form, but has not acted as efficaciously as might be expected from its antiseptic effect upon mucous membrane.

The use of *small injections* has a limited field, except for the cleansing and evacuating of the contents of the rectum. Starch-water and laudanum may be given in this way, but only after the use of the first-named injection; the dose should not be sufficient to cause a general physiological effect of the opiate, a mere local action to relieve tenesmus being desired. These methods are not mentioned with approval.

Solutions of silver nitrate, containing gr. $\frac{1}{2}$ or gr. $\frac{1}{4}$ to the fluid-ounce, together with 5 to 10 drops of deodorized tincture of opium, not more than from ʒj to ʒij being used at a time, are serviceable where the inflammatory area can be reached by these low injections and when it is not of an intense degree. Small injections of astringents or of ice-water or the introduction of small lumps of ice into the rectum have been recommended, but with some these measures

have seemed to increase, and not to decrease the inflammatory process. The application of stronger solutions of antiseptics and astringents is better adapted to chronic dysentery.

2. *Injections of large quantities* of water, containing astringents or antiseptics in solution, are employed to bring the drug in direct contact with the inflamed surface to be treated, both for the purpose of cleansing and of disinfecting the canal. The selection of the apparatus and also the method of its application are important. The tube to be used should be about twenty-four to thirty-six inches in length and No. 27 English (No. 41 French) in size; it should be flexible, and fenestrated on the sides, the openings being smooth and large; an opening on the end is worse than useless. The fluid to be used is to be introduced from a fountain or Davidson's syringe, or may be poured into a funnel attached to the end of the tube. This should always be done under low pressure and slowly, in order that the fluid may have time to distribute itself beyond the point of entrance. This will avoid the danger of overdistention and possible rupture of the thin-walled intestine when ulceration has occurred.

The question arises as to how far the tube should be introduced into the rectum—if it should go beyond the curve of the sigmoid flexure. It is very difficult to pass a tube beyond this point, as it almost invariably turns on itself. Perseverance to this end would attain nothing, and there is danger of forcing the end of the tube through an ulcerated bowel into the peritoneal cavity. The fluid thrown into the rectum and sigmoid flexure will reach the colon. I have had the opportunity to demonstrate the facility with which this takes place, in the case of a fæcal fistula of the cæcum following an operation for appendicitis. Colored fluid was forced into the rectum with a Davidson's syringe, and, under gentle pressure, escaped in half a minute through the fistulous opening in the right iliac region. Frequent repetition of this experience has proved, beyond doubt, that fluid introduced into the rectum attains the same result, as when the tube was made to reach the colon. In the case of an artificial anus in the upper third of the descending colon, due to malignant disease, the same facility of colon-irrigation was demonstrated.

Various mineral and vegetable astringents are employed by this method, the rationale for the use of astringents being found in the resulting contraction of the injected blood-vessels, but they have no effect upon the disintegration of tissue nor upon the decomposition that is going on in the intestinal canal. For this purpose alum, lead acetate, and tannic acid are used, in strengths varying from 1 to 4 parts to 500 of warm or cold water. Silver nitrate is very much used, particularly where the ulceration is extensive. Tannic acid is especially advocated by Cantani, not only for its astringent prop-

erties but also as an antiseptic, and because it combines with the ptomaïnes and forms insoluble, harmless tannates. When using this method the need of injection under slow pressure is to be emphasized. The patient should lie on his left side, with the hips raised; the fluid should remain in the intestine five, ten, fifteen, or twenty minutes.

The favorable indications for continuance of the treatment will present themselves at once, the stools becoming less frequent, the foul odor, mucus, blood, and pus will disappear, and the fever and general symptoms improve. Where relapses have occurred after discontinuing this plan of treatment, return to it has soon brought relief and a termination of the disease.

Dangers from this form of treatment are the over-distention of the bowel and the possible retention of a large amount of fluid. In the first case there would be risk of rupture of the bowel as already stated, and the tormina will be increased by stretching. The object of ridding the bowel of decomposing fluid and its disinfection is not accomplished and the source of auto-infection is not removed by injection.

3. *Irrigation or Lavage of the Intestine.*—This form of treatment differs from the injection method in that the return flow of the fluid is provided for, and thus the bowel is emptied of its decomposing contents and the diseased surface kept clean, as an external wound would be under antiseptic methods.

A large flexible tube, No. 27 English (No. 41 French) in size, can be used for this purpose. It should be introduced high into the rectum or within the sigmoid flexure and the water or solution allowed to flow in. When about six or eight ounces of the fluid are introduced it should be allowed to escape. In this way the process can be repeated indefinitely, until the return is perfectly clear; usually not more than from two to four pints are necessary. The advantage over the method already mentioned, is that it is less painful and obtains better results.

Two soft-rubber tubes may be used, passed side by side into the rectum, one for introducing the fluid (No. 17 English or 29 French in size) and the second two sizes larger being for the free outflow. The syringe should be attached to the smaller of the two and the fluid gently forced in. A current is soon established, and if this procedure is continued long enough considerable débris of membrane, fæcal matter, and blood and pus will be washed away. The returning fluid will be stained for some time, showing that not only is the rectum but also the colon being washed and cleansed of its contents.

Results obtained from this treatment show a lessening in the frequency of the stools; the character changes, putridity disappears, and the blood and pus diminish.

A cardinal point on which I have insisted in dysentery is that the rectum is like an over-distended bladder discharging its overflow, the contracting and irritable sphincter retaining a residuum of decomposing fluid. This can be demonstrated by the introduction of the rectal tube immediately after a stool. The escape of a certain amount of retained fluid shows that the rectum does not empty itself no matter how frequently the efforts may be made. The irrigation method removes this accumulation, evacuates the bowel, and acts upon the causative agent of the disease. Marked benefit follows where there is extensive ulceration with large, foul-smelling stools, fever, tormina, and tenesmus. Such a result could not be obtained by any other form of treatment. If the sphincter is irritable and the tenesmus great, we may follow the use of the irrigation with $\frac{1}{2}$ grain of the aqueous extract of opium in suppository. As improvement takes place this may be omitted except to quiet nervous irritability or induce sleep—for which purpose, though, the subcutaneous injection of morphine gr. $\frac{1}{8}$ to $\frac{1}{4}$, combined with atropine gr. $\frac{1}{150}$ to $\frac{1}{120}$, is more satisfactory.

The water used for irrigation should be about 100° F. and a sufficient quantity allowed to enter and escape until the returning fluid is clear; about two to four quarts usually suffice. The frequency of use depends upon the severity of the case; ordinarily from two to six irrigations a day may be enough, the intervals to be increased as improvement takes place; but when there is evidence of much ulceration, as recognized by the character of the discharge and the symptoms, the irrigation should be as frequent as every three hours.

Antiseptics are used in this way for the purpose of retarding the action of the micro-organisms, but more effect is obtained by the frequency of the irrigation than by any ascribed disinfecting quality of the drug used. Boric acid (5 to 10 : 500) is the safest and best; tannic acid (1 : 500), salicylic acid (1 : 500), carbolic acid (1 : 2000), or naphthol (1 : 4000), are used in solution in the strength indicated. Hydrogen dioxide or salt may be used without any danger. Corrosive sublimate is dangerous, no matter in what strength it is used, as retention of the fluid may occur and poisoning follow. Osler has obtained good results from the use of quinine (1 : 5000 or 1 : 2500 or 1 : 1000), claiming that it rapidly destroys the amœba coli.

The astringents already mentioned may be specially and advantageously used by irrigation when the intensity of the symptoms has abated and the stools are more diarrhœal in character, or when the tendency of the disease is to become chronic. For continued ulceration, silver nitrate is particularly adaptable, stimulating the ulcers to heal; it is mildly antiseptic and astringent.

Continued experience with treatment by irrigation as here described,

and the reports of the success of the method when employed by others have added to my faith in its value. The failure to obtain good results is due to improper or imperfect methods in carrying out the plan suggested or to a lack of perseverance. In my experience but few nurses understand irrigation methods. The idea with them is to fill the bowel with a large quantity of fluid, trusting to the contraction of the overdistended bowel and to the voluntary effort of the patient to expel it. Such a method is irrational and harmful in all cases; in acute dysentery it is dangerous.

Further treatment of the patient is symptomatic. For sleeplessness and pain, tormina and tenesmus, the use of morphine hypodermically is the only satisfactory remedy, and should be employed according to the absolute needs of the case, with the precautions already given. For pain in the abdomen, hot fomentations or poultices are often grateful to the patient. Measures for supporting strength and preventing failing action of the heart are a concentrated diet and stimulants, as brandy, ℥ss, every two hours, or strychnine, gr. $\frac{1}{60}$ to $\frac{1}{30}$, every six hours, or tincture of digitalis, gtt. v–x, or nitroglycerin, gr. $\frac{1}{100}$, every three to six hours. Solid food should be forbidden for some time, and liquid diet continued until the subsidence of all symptoms.

CHRONIC DYSENTERY.

The condition called chronic dysentery follows an acute attack; there is a chronic flux due to the persistence of unhealed ulcers. An imperfect cure often results from imprudence in eating and unwise management in convalescence. Severe attacks with deep ulcerations often lead to it. The delicate cicatrix which has formed may break down, when reopening of the ulcers occurs. These ulcers may vary in position, size, and number. There may be but one, or the whole colon may be studded with them, with intervening ridges of thickened tissue of polypoid formation as described by Woodward. The intestine is uniformly or irregularly dilated or contracted. In amœbic dysentery, amœbæ may be found in the contents of the intestine, in the walls of the intestine, or in abscess of the liver due to an embolic process.

The symptoms are frequent fluid or semi-fluid stools, containing mucus, blood, and pus in variable amounts; the stools may be lienteric and in other respects may resemble chronic diarrhœa. Borborygmi and tympanites accompany the diarrhœa, the appetite is variable, the tongue is red and glazed, and disordered digestion and hectic fever

add to the debilitated condition. Emaciation and anæmia are extreme from innutrition. Occasional acute exacerbations occur, and the patients waste away and die from exhaustion or from one of numerous complications.

Treatment.

The best prophylactic measure is the care of convalescents from acute attacks. Too early exercise and the return to regular routine in life are to be delayed, and a liquid diet, rest, and proper hygienic measures must be continued for months after severe acute attacks. When relapses occur the same measures and caution are to be adopted as in the original illness.

Change to a cool, dry climate, and rest from physical and mental strain, in those much weakened, are often necessary.

Diet.—Unless there is strict regulation of the diet, acute exacerbations may occur or the stools may increase and become bloody and purulent. For the capricious appetite and disordered digestion milk is best suited; peptonized milk or koumyss may be tried, and should be continued for several weeks; beef-juice, buttermilk, and matzoon may be alternated with these, and, as improvement takes place, concentrated animal broths, raw or soft-boiled eggs may be added gradually. Several months should elapse before a more mixed diet is given, and when begun should be of the most digestible foods, as raw oysters, raw scraped beef, chicken, sweetbreads, bread, rice, or other farinaceous foods.

Aids to digestion, as pepsin and dilute hydrochloric acid, may be given after meals. Tonics, as iron, quinine, and strychnine, may prove of benefit, but relatively are of little value.

Where tympanites and evidence of decomposition from intestinal indigestion occur, various intestinal antiseptics, such as bismuth salicylate, magnesium salicylate, benzo-naphthol, and others, may be of use. Attention to diet and rest, together with rectal irrigation, will bring about the best results attainable.

Irrigation of the Rectum and Colon.—The irrigation should be used as described for Acute Dysentery. Silver nitrate, in the proportion of gr. v–x to the pint, is the best remedy for persistent ulcers. When the ulcers are in the rectum and can be reached, local applications of a strong solution of silver nitrate, or pure nitric acid, should be made through a speculum, previously cleansing the surface by irrigation with water; after the application the rectum must be washed out with salt or bicarbonate-of-soda solution.

THE INTESTINAL PARASITES.

By H. A. HARE, M. D.

Although many different forms of parasites have been found in the alimentary canal of man, there are only three varieties commonly met with in medical practice in this or other countries. Of these we find the tape-worm in its various kinds, the round worm, and the so-called thread-worms. The tape-worm (or *tænia*) and the round worm (or *ascaris lumbricoides*) are found in the small intestine if in their normal habitat, while the thread-worms (or *oxyuris vermicularis*) are inhabitants of the rectum. In addition to these common parasites we rarely meet with the *anchylostomum duodenale* and the *trichocephalus dispar*.

The tape-worm occurs as the *tænia mediocanellata*, which nearly always finds entrance into the body by reason of the eating of raw or imperfectly cooked beef; the *tænia solium*, which is usually found as the result of using raw pork; and the *bothriocephalus latus*, which finds its entrance into the alimentary canal by the patient having eaten raw fish infested by this parasite in its cystic stage. The latter worm is exceedingly rare in America, but the others are quite common, particularly the tænia solium, which is sometimes called *tænia saginata*. In addition to these worms we more rarely meet with the *tænia cucumerina*, which is the parasite often found in the intestine of the dog, and the *tænia flava punctata*, which has only been found as a parasite of man two or three times, although it is a frequently found parasite of the common rat. The *tænia nana* is equally rare.

Before discussing the treatment of a patient suffering from worms in the intestinal canal, the diagnostic facts in connection with intestinal parasites must be recalled. In the minds of the laity the fact that a child is nervous and irritable, picks its nose, or has running at the nose and eyes is "a sign of worms." Itching of the anus is another symptom regarded by the laity as an infallible diagnostic sign. It seems hardly necessary to point out that there is nothing pathognomonic in such symptoms, and that, while these symptoms may be present as a result of, or along with, the development of intestinal parasites, they are also manifest in full force in children who have chronic or subacute gastro-intestinal catarrh and are not infested by worms. The

only positive diagnostic point in deciding that worms are present is the discovery of a segment of the tape-worm or its eggs, or a round or thread-worm, in the stools; and this may, in the case of the round worm, really indicate that the patient has been freed from his parasite. On the other hand, it must be remembered that the round worm occurs in numbers rather than singly, and therefore the passage of one is a fairly reliable sign of others being present and justifies the use of an anthelmintic.

Aside from these facts in connection with diagnosis it must not be forgotten that tape-worm is capable of causing a more or less well developed anæmia; and a history of the ingestion of meat of doubtful character should cause a careful watching of the stools for segments and for the eggs, which are often passed in great numbers. These eggs should be sought for by the microscope or a powerful magnifying-glass, as they are very small. They are round and covered with a hard shell, which can be broken, and which, when broken, reveals a few hooklets. The egg of the tænia solium is slightly smaller than that of the tænia mediocanellata. The eggs of the bothriocephalus latus are very large, oval, light brown in color, and very easily broken. As the segments of the bothriocephalus latus are rarely shed, and as it is the form of tape-worm which produces the grave anæmia, just mentioned, in the majority of cases of parasitic anæmia, an examination of the fæces for its eggs is very important.

If the round worm be the parasite, it may on rare occasions crawl up into the stomach and be vomited by the patient; but this is a much more uncommon occurrence than charlatans and hysterical malingerers or insane persons would have us believe.

Treatment.

A very large number of remedies have been given for the removal of both the round worm and the tape-worm, but there are only a few which can be regarded as entirely reliable, and these will fail to produce the desired results if the physician administers them without taking certain precautions as to the time of their administration, the diet of the patient, and the treatment which is to follow the use of the anthelmintic.

After it has been decided that a vermifuge is needed the patient should take no food after his ordinary evening meal, and the next morning, before any nourishment is taken, the dose or doses of the anthelmintic should be given, and be followed every fifteen or twenty minutes by calomel in the dose of one or two grains until about 10 grains have been taken. From half an hour to an hour after the last dose of calomel and three or four hours after the last dose of the anthelmintic, a full dose of some saline purgative should be adminis-

tered, or in its place castor oil should be given in sufficient quantity to ensure a free movement of the bowels. Each movement of the bowels that takes place should be carefully inspected to discover whether any worms have been dislodged, as the diagnosis that the patient is a sufferer from worms cannot be considered as absolutely proved until a worm or some portion of a worm is expelled. In the case of the tape-worm the patient cannot be considered as relieved permanently unless the small head of the worm is discharged from the bowel; many feet of segments may be passed with only temporary relief to the patient, because the head of the worm has not been dislodged and will soon develop segment after segment, which will rapidly take the place of those which have been discharged. Whether the case be suffering from round worm or tape-worm the careful physician will also see that the patient receives immediately after the action of the purgative medicine a copious rectal injection of salt water in order that the bowel may be thoroughly washed out, and, in this liquid, when it is expelled from the bowel, there will be found quite frequently additional worms to those freely passed, particularly if the patient has suffered from the ascaris lumbricoides. If the tape-worm has been the infesting parasite the head will perhaps be washed out of the bowel by this means, and, as this worm is usually found singly, the passage of a head is a fairly certain sign of cure.

The remedies which we have mentioned as being the best for the removal of the *round worm* are santonin and spigelia. Santonin itself should always be employed in preference to the santoninate of sodium, which because of its solubility may be absorbed from the stomach or the upper portion of the small intestine before the worm has been seriously poisoned by it. The result of this absorption is that the patient experiences the full physiological effect of the drug and the worm is but slightly affected by the medicament; whereas, if santonin is given in its crystalline form, without being powdered, it is dissolved and absorbed so slowly that it comes in contact with the worm in full strength and speedily poisons it.

The dose of santonin for a child of five or six years is 1 to 2 grains, preferably given in capsules or in a troche. The dose for an adult is 4 to 5 grains, or as much as 8 grains may be given, but the latter amount is perhaps slightly beyond the line of safety and if administered should be followed within two or three hours at the most by a freely acting saline cathartic which will sweep it from the bowel before a sufficient quantity can be absorbed to seriously affect the general organism.

Spigelia is equally effective with santonin and is the safer drug of the two. Its fluid extract may be given under the conditions that we

have named in the dose from 1 to 2 drachms to a child, or, if an adult is affected, in the dose of 2 to 4 drachms. Very frequently it is advisable to combine this fluid extract with an equal quantity of the fluid extract of senna, since this mixture not only makes the worm let go its hold, but also moves the bowels and sweeps the parasite from the intestine before it can recover from the effects of the poison. Although spigelia when taken in overdose produces symptoms almost identical with those of belladonna, and although the symptoms may at times be quite alarming, it cannot be considered a very dangerous drug from a lethal point of view.

For the removal of the tape-worm there are three remedies which should always be preferred to all others, namely, pelletierine, the active principle of pomegranate, the oleoresin of filix mas or male fern, and that homely, but nevertheless efficient remedy, pumpkin-seed. We have named them in the order of their value. The pelletierine is always employed in the form of the tannate of pelletierine, the dose of which is from 3 to 5 grains, and practically the only preparation of pelletierine which is employed is that of Tanret, in which the alkaloid is put up in a syrupy solution in small bottles each of which contains one dose. The drug when absorbed, after being given in overdose, is capable of producing symptoms of serious poisoning due to paralysis of the peripheral ends of the motor nerves. When a full dose is given the physician should take care that the patient is freely purged within two or three hours afterward. The small size of the dose, the fact that it is not disagreeable to take, and the extraordinary power which pelletierine has in the poisoning of the tape-worm render it by all odds the most valuable anthelmintic for this form of intestinal parasite that we have.

On the other hand, it cannot be denied that aspidium or filix mas or male fern, as it is variously called, is also a very efficient remedy for the removal of the tape-worm. The dose of the oleoresin should be ½ to 1 fluidrachm, given in small capsules, great care being taken that the patient is starved for a number of hours prior to its administration in order that the worm may not be protected by the presence of food and drink in the stomach and bowel, which will dilute the poison so that it is almost harmless to the worm. This remedy also should be followed by an active purgative, preferably one of the salines. It is a noteworthy fact that castor oil has been found to so increase the absorbability of the oleoresin of filix mas as to distinctly increase the danger of poisoning by this substance when it is given. Oily purges should therefore never be given when male fern has been used for the removal of tape-worm.

Pumpkin-seed, or as it is officially called, pepo, is often obtainable when these more refined anthelmintics cannot be had. The ordi-

coverings of the seeds should be removed and the remaining portion rubbed up into an emulsion, or be made into a paste which can be formed into an electuary by the addition of sugar. The dose of the seeds deprived of their outer coverings should be, for an adult, two ounces, and their administration should be followed in two or three hours by an active purgative. The large bulky doses necessary when pepo is used for the removal of tape-worm renders it disagreeable to most patients.

Thread-worms may be removed from the rectum by directing the patient's nurse or attendant to give a mild purgative followed by a copious injection of salt and water, or soap and water, to thoroughly cleanse and empty the bowel of fæcal matter. Immediately after this is done the rectum should receive by injection from a half to one pint of a decoction of quassia made by placing an ounce of quassia-wood chips or powdered quassia-wood in one and a half pints of water, and boiling it down to one pint. The patient should hold this injection for some minutes before passing it. If the bowel is thoroughly cleansed so that the worm is not protected by fæcal matter or mucus a very few such injections, given at several days' interval, will be most efficacious. Thymol solutions, and turpentine enemata of the strength of 1 drachm to the pint of soap and water, are also useful.

The *trichocephalus dispar* is so harmless that its presence is often unknown. It causes practically no irritation, but if it is to be removed copious quassia injections should be given.

The most important of the rarer forms of intestinal parasites is the *anchylostomum duodenale*, sometimes called *uncinaria duodenalis*. This parasite is usually found chiefly in the jejunum and is much smaller than either the round or tape-worm, the male being from 6 to 10 mm. and the female from 10 to 18 m'm. in length. Although this worm is so small, its presence in the intestine in large numbers results in the speedy development of a profound anæmia in the patients infested by it. Indeed, the anæmia may be so severe as to result in death, and in Europe where the parasite has been spread by the employment of Italian and Polish laborers this form of intestinal parasite is not by any means rare. Infection usually occurs through the water-supply. It having been decided that the patient suffers from this form of intestinal parasite care should be taken that he does not infect others by depositing parasites in any place where they may infect the water-supply.

The diagnosis of infection by the anchylostomum duodenale can seldom be made by finding it in the fæces, for it rarely is discharged unless poisoned by drugs. The fæces always contain, on the other hand, large numbers of the eggs, which should be sought for in all

cases of persistent anæmia with a history of exposure. These eggs occur as unsymmetrical, thickly covered globules, and if the stools be placed in a warm spot the embryos can be seen to develop in the eggs.

The patient infested by the anchylostomum duodenale should receive full doses of thymol, as for example 30 grains in a cachet early in the morning and 30 grains two hours later, these two doses being followed in two hours by an active purgative. It is claimed that thymol is an absolute specific for the destruction of this parasite.

THERAPEUTICS OF RENAL DISEASES.

By NATHAN S. DAVIS, Jr., A. M., M. D.

What of knowledge has recently been contributed to renal therapeutics can be best set forth in a general consideration of the action of drugs upon this class of diseases.

By medical and hygienic treatment we attempt to correct disturbances of function. It is, therefore, natural in introducing the subject of renal therapeutics to inquire, first, What are the functions of the kidney? and, second, How are they disturbed by the processes which we call disease?

It is the purpose of the kidney to remove any excess of water that may be in the blood and to excrete with it certain of the waste products of tissue-change. The first of these is accomplished chiefly by filtration through the capillaries within the epithelium which lines the glomeruli; the second is accomplished by the epithelium of the convoluted tubules, because of the peculiar selective and excretory powers of its cells. It is probable that some of the salts of the blood, such for instance as sodium chloride, escape with the water through the glomeruli, but the nitrogenous excreta undoubtedly escape through the cells of the convoluted tubules. It is also probable that some of the fluid which escapes through the glomeruli is absorbed again, as it passes from the convoluted tubules into the loop of Henle and the straight tubes. Possibly other substances are also thus re-absorbed; but whatever reabsorption occurs in man is trifling.

These functions of eliminating water and organic and inorganic salts in solution in it may be disturbed so that each is increased, diminished, or suppressed, or new, abnormal substances may make their appearance in it. Some of these changes may be due to modification of function which is not associated with change of structure, but more frequently change of structure develops coincidently with change of function or precedes the latter.

Changes in the quantity of urine or of its normal constituents often occur without structural lesions in the kidneys, but such abnormal ingredients as albumin, blood, and tube-casts only appear when well-marked anatomical changes have developed.

The quantity of urine may be increased because all the functions of the kidney are augmented, or because water only is escaping from

the blood more rapidly than is usual. In diabetes mellitus the entire kidney is functionally unusually active, for both an abnormally large quantity of urine is eliminated, and an unusual quantity of the salts ordinarily excreted by these organs. The percentage of sugar present increases the specific gravity of the urine only triflingly as compared with its total increase in this disease. Its greater weight is chiefly due to an excessive elimination of urea and other salts. The presence of an excess of sugar in the urine provokes the unusual diuresis, but the rapid bodily waste and therefore the excessive tissue-change throughout the body gives the kidneys an unusual amount of eliminative work.

In diabetes insipidus or essential polyuria it is the glomeruli which are put to excessive use, and there continuously filters from them more fluid than is normal, but as no unusual supply of eliminable material is brought to the cells of the convoluted tubules the urine is relatively light in weight, or, in other words, its percentage of salts is low.

POLYURIA.

Polyuria is due to a variety of causes, some of which are temporary in action and therefore produce no effects requiring treatment. This is true of the excessive urination which is provoked by copious drinking. Large quantities of pure water may produce such polyuria, but oftener it is large quantities of milk, beer, or beverages strongly charged with carbonic acid gas, which are more powerfully diuretic, that provoke the unusual flow of urine. An excess of sugar, or urea, or both, in the blood will cause polyuria. This can be corrected only by preventing the excessive production of these substances in the body. A modification of diet, such for instance as abstinence from sugar and starches in the one case, and from albuminoids in the other, may effect the object. But oftener the presence of these substances in the blood in unusually large amounts is due to faults in the functional activity of the pancreas, liver, or tissues generally. Such polyuria does not demand medication addressed to the kidneys. Excessive urination may result from diseases of the nervous system. A centre has been demonstrated in the medulla which at least in part controls the activity of the kidneys. Structural diseases of the brain, medulla, and upper cord have been associated with excessive urination, and with its suppression. A frequently recurring symptom in the functional nervous diseases epilepsy and hysteria is polyuria. Many times it follows an epileptic paroxysm, and quite as often occurs with or during the subsidence of hysterical excitement. In

these diseases, also, no medication is required for so transitory a condition.

The polyuria which accompanies renal diseases, notably amyloid kidney and interstitial nephritis, is protective and is to be encouraged, not checked. In these maladies a diminished excretion of nitrogenous waste, which may endanger life, is apt to occur because of the destruction of renal epithelium which characterizes them. If the quantity of urine can be kept large, though its specific gravity may be low, danger to life is lessened. The only form of polyuria which demands treatment is the essential form often called diabetes insipidus.

Diabetes insipidus is characterized by the elimination of an excess of urine, as much as 25 to 50 pints per diem in some instances. The urine is pale, limpid, of low specific gravity, 1001 to 1005. The total of the solids in it is small, although sometimes the quantity of urea is relatively large. Abnormal ingredients are rarely found in the urine in this disease. An excessive thirst accompanies the polyuria. The tongue is usually dry. Appetite may vary, but is generally good. Loss of flesh is not uniformly present, for patients afflicted with the malady may maintain good body-weight. An appearance of good health exists, but usually malaise and lessened endurance are noticeable. The skin is apt to be dry, possibly because of excessive elimination of fluid by the kidneys. This malady may last for years. Death usually results from some superimposed disease. Spontaneous cures have been observed.

No anatomical changes are characteristic of essential polyuria. Even its exact nature is unknown. Its peculiar symptom is probably due to changed blood-pressure within the renal vessels produced through the agency of the vasomotor nerves.

The conditions under which it is likely to arise can rarely be modified favorably.

It occurs at all ages, but oftenest in those who are young, and in males. It has been known to be congenital. It not infrequently recurs in the same family in different generations.

Although by no means constantly associated with structural changes in the central nervous system, or with sudden mental shock, it frequently is. Traumata have apparently provoked this syndrome, as have tumors of the brain and lesions of the medulla. Paralysis of the sixth pair of nerves has so often been associated with diabetes insipidus as to attract the attention of clinicians. Sunstroke, violent excitement, great emotion, have been regarded as conditions essential to its production in some instances. It has followed the drinking of excessively large quantities of cold water, and of cold beer and other alcoholics.

When this malady is treated, the quantity of fluid ingested must first be regulated. It must be lessened gradually to a normal amount, about three pints. Especially should very cold beverages be avoided, and milk, beer, cider, and other alcoholics, as they are diuretics. Watermelon and grapes should be eaten sparingly, if at all. The free use of sugar and very amylaceous food is not permissible. Emotional excitement and both mental and physical fatigue must be avoided. Exercise, however, that is regular and moderate in amount is commendable. An abundance of rest and sleep is desirable. Assistance can be obtained by provoking the vicarious elimination of fluids from the lungs, skin, and intestines. Respiratory exercise, especially in a dry climate, will accomplish this. A residence in a dry and attenuated air will readily quadruple the elimination of fluid by the lungs and skin. Altitudes of from 4000 to 6000 feet in Colorado, New Mexico, and Arizona are especially adapted to these cases. At lower altitudes, and in moist climates, breathing exercise, hot-air and hot-water baths, dry friction of the skin, and warm clothing will aid in effecting an amelioration. Rarely pilocarpine or jaborandi have been resorted to. The provocation of free catharsis by drastics, salines, or calomel will also do good.

As is true of most diseases that are particularly persistent, a great many remedies have been recommended for this one, none of which are uniformly useful. Because of the persistency of the malady and its uncontrollability by medicines, physicians feel the need of many things to which to resort. In each case which I have had to treat I have found my former experience of little value. The class of drugs most uniformly beneficial is that which acts upon the nervous system. Valerian in large doses is one of the best. Castor, musk, asafœtida, camphor, and belladonna have also been used. They are most useful in cases following strong emotion and great excitement. Opium, as is well known, lowers arterial tension, and to a marked extent diminishes the formation of urine; this drug and its derivatives morphine and codeine are among the best remedies for this malady. The bromides have also been employed, but are much less uniformly efficacious. Nux vomica has apparently done good. The benefit obtained from it, from belladonna, ergot, and astringents is due to the contraction of renal arteries or afferent branches to the glomeruli, and consequently a diminished supply of blood to the glomeruli. But unfortunately these drugs have no selective affinity for the kidneys. They commonly contract all blood-vessels simultaneously and increase arterial tension generally. Whenever this is effected increased diuresis rather than lessened is the result. The perchloride of iron, the acetate of lead, and tannic and gallic acids have been administered internally, hoping that their astringent properties would lessen the flow of urine.

Antipyrin, phenacetin, acetanilide, and salicylates have been used because of their analgesic properties.[1] It is, however, more probable that their diaphoretic properties are their valuable ones in this malady. Balsamic preparations have also been lauded, such as copaiba, turpentine, and balsam of tolu. They are, on theoretic grounds, contra-indicated, for they produce active congestion of the renal vessels which provokes diuresis. A diminution of urine can only be effected by them when they are used in dangerously large doses, which produce inflammation of the kidneys or a degree of congestion which closely borders upon it.

The continuous electric current has sometimes been employed with apparent benefit. It has been passed from the lumbar to the cervical region along the spine. In those cases complicated by anæmia and debility, iron, quinine, and reconstructives are needed. The iodides and arsenic are frequently employed, although no good reason can be given for their use.

NEPHROLITHIASIS.

Although the kidneys are competent, not infrequently certain ingredients of the urine are eliminated in abnormally large quantities, leading to their deposition in solid crystalline forms either in the substance or the pelvis of these organs. Stone in the kidney or *nephrolithiasis* is also due sometimes to decomposition of urine in the kidney-pelvis. Two large groups of cases of stone are recognizable: one in which the stone forms in acid urine; the other in which it forms in alkaline. The former includes the uric acid and oxalic acid calculi; the latter the phosphatic. Calculi are not infrequently of mixed structure. A tendency to form both uric acid and oxalic acid calculi may exist simultaneously. A calculus made of either of these substances may excite pyelitis, which in turn will produce alkaline urine by provoking fermentation in it, and then phosphates may be deposited as a layer upon the original stone, or form new ones. Phosphatic calculi within the kidneys are always preceded by and associated with catarrh of the pelvis.

The symptoms of stone are in mild cases aching in the back or loins, usually upon one side only, especially when patients stand long or are much jolted. An excess of mucus and some pus can often be found in the urine. Hæmaturia is not infrequent, especially when stones are composed of oxalic or uric acids. Stones may lie in the pelvis of a kidney or remain partly imbedded in its substance indefinitely with-

[1] A. Duchamp, *Traité de Thérapeutique appliquée*, fasc. ii. p. 133.

out producing symptoms. When stones are passed from the kidneys renal colic is provoked. Very fine renal sand can be voided without pain, but it oftener produces discomfort and sometimes colic. The pain of renal colic is first felt in the loin, later diagonally across the lower part of the abdomen toward the bladder. At the same time lancinating pain will often strike the testicle on the affected side. An inclination to urinate with frequency is the rule. When stones are large colic is apt to be severe. Its location is that of the milder pain, but when intense it can be located with difficulty, for it seems to be diffuse. The symptoms of collapse may develop in cases of intense pain. Nausea and vomiting are common even in milder ones. A diagnosis of the kind of stone that produces a colic can only be made by examination of it.

Uric acid calculi are due to uricacidæmia—that is, a dyscrasic state or constitutional fault characterized by an excess of uric acid in the blood. Or, they may be due to great acidity of the urine, which is commonly caused by an excess of acid phosphates. An excess of the latter is due to a fault in nutrition, the exact nature of which is unknown. Individuals who are liable to uricacidæmia are also liable to excrete unusually acid urine. The two conditions which lead to uric acid lithiasis are therefore apt to exist together. The free use of nitrogenous food tends both to increase the formation of uric acid and to make the urine acid.

These facts give us a key to prophylactic treatment for those who have uric acid calculi. Albuminous foods should be permitted only in small amounts. The least objectionable are chicken, fish, oysters, and eggs. It is best to advise that meats be eaten very sparingly. On the other hand, a vegetable diet if adhered to too strictly may increase an existing tendency to the formation of oxalic calculi. Patients should be instructed to drink copiously pure water in order to increase the quantity of urine and to wash as much of saline matter as possible from the blood, thus preventing its lodgment in the urinary passages. Alcoholic drinks should be interdicted, for they lessen oxidation of waste products and are irritants to the urinary channels. Moderate exercise can be encouraged, for it promotes more complete and perfect metabolism, and whenever that exists waste products are most certain to be transformed into as eliminable a form as possible. Violent exercise will produce an excess of waste and overtax the organs of elimination. By friction of the skin and warm baths its excretory power can be encouraged. Derangement of the stomach and bowels is a common cause of uricacidæmia and oxalicacidæmia. Such conditions should be corrected and their return prevented.

Medicinal treatment consists mainly in making the urine alkaline

and keeping it mildly so, in making with uric acid soluble compounds, and lastly in provoking freer diuresis. Bicarbonate of sodium or potassium is often prescribed as an antacid in doses of from two to four grains daily. The carbonate, citrate, and benzoate of lithium are also favorite remedies. They not only make the urine alkaline, but are supposed to form lithium urate, which is a readily soluble salt. The daily dose of these is from 40 to 60 grains. The benzoates (of sodium, potassium, or lithium) have the added advantage that they form with uric acid soluble hippurates. While these reactions with uric acid are easily demonstrable in the laboratory it has been denied that they occur in the human organism. In the stomach lithia meets phosphates and triple phosphates, forming with them nearly insoluble compounds which prevent its reaching the uric acid of the blood and tissues. Moreover, Haig claims that by depriving the blood of part of the phosphate of soda which it normally contains, and which it gets from the alimentary tract, the excretion of uric acid is actually lessened instead of increased. The phosphates form soluble combinations with uric acid and aid its elimination. In spite of these contradictory views lithia is generally conceded by clinicians to do good. The best results, however, are usually obtained from very dilute solutions such as natural lithia waters. The diuresis produced by the imbibition of large quantities of fluid is probably the chief cause of good results when these waters are employed.

Piperazin is a drug which has been used for a comparatively short time. It is certainly efficacious. It increases the oxidation of excrementitious matter and makes uric acid soluble. It may therefore lessen its formation, and certainly aids its elimination. Although when stones of moderate size exist they cannot be dissolved by any agent as yet known to us, uric acid sand may be, and I believe the sharp corners of even larger stones can be smoothed. One of my patients who was long under treatment passed uric acid gravel often, and passed smooth stones whenever piperazin was used for some time, and angular, acicular stones when it was not employed. The daily dose of this drug is about 45 grains.

To lessen the concentration of urine it is all-important to increase diuresis. Alkalies will help to promote it, but reliance must chiefly be placed upon water and milk. Patients should be encouraged to use them freely. Diuretics, irritating and congesting the kidneys, should not be used.

Oxalic acid calculi are caused by the presence of this acid in the blood. Its source is commonly foods which contain it. Therefore they must be forbidden. The commonest of them are rhubarb, sorrel, tomatoes, tea, spinach, cabbage, and celery. Some clinicians also forbid turnips, onions, apples, and pears.

Indigestion is as essential as the presence in the stomach of food containing oxalic acid for the formation of these calculi. Indeed it is claimed by some chemists that bacteria can produce the acid out of sugar, starch, and cellulose. Prevention and correction of indigestion are more essential to effect a cure than the withdrawal of the foods just named from the patient's dietary. The character of the digestive disorder which underlies the malady affords indications for more exact dietetic prescriptions.

Exercise, an outdoor life, freedom from anxiety and care are also essential to successful treatment.

Alkalies are useless as solvents. A variety of acids have been employed with the hope that they would dissolve the oxalates, but they have proved worthless. Diuretics do good, but they must be employed with caution, for at times they provoke the passage of calculi and precipitate renal colic or hæmaturia. They do good by washing the oxalates from the system before they can be deposited in the tissues.

When calculi are phosphatic, the amount of vegetable food eaten should be restricted, so that the urine will not become unnecessarily alkaline. Such acids as nitric and citric, and such drugs as acid sodium phosphate, have been used to make the urine acid and to prevent its decomposition and the precipitation of phosphates. The results have not been satisfactory. Urotropin in daily doses of from 15 to 90 grains is of value. Except when pyelitis is particularly severe it will make the urine strongly acid. Saccharin has a similar but less noticeable effect. In this form of lithiasis, as in the others, diuretics are of prime importance, and none are better than water and milk. As phosphatic stones in the kidney are always associated with catarrhal inflammation of its pelvis, this lesion must be combated.

Water or milk to be efficacious as a diuretic must be used in considerable quantities. Often patients are unaccustomed to drink much of either. For such it is best to prescribe water in gradually increasing amounts, at first three or four glasses daily, and an increase of one glass every one or two days until four to six pints are taken each twenty-four hours.

Mineral waters are used extensively in Europe to combat renal lithiasis. The waters in this country often employed with benefit are the almost pure waters, those unusually free from mineral matter, such as the Waukesha waters, and lithia waters such as the Londonderry, Buffalo, and Geneva lithia. It is probable that they do good because they are taken in quantities which make them diuretic. The Kissingen, Vichy, and Geyser springs of Saratoga (New York), and those of Vichy, Vals, Contrexeville, and Kissingen in Europe, are

especially good for patients who are strong and dyspeptic. They are rather contraindicated for those who are anæmic, weak, or neurasthenic. The West Baden spring of Indiana, the Congress and Hathorn of Saratoga, and the Carlsbad of Austria, are useful for the same class of patients, and are especially good for those who are stout. The mineral matter in these waters stimulates better oxidation of waste and helps to correct digestive and intestinal disorders. The West Baden and Carlsbad waters are decidedly laxative as well as diuretic. Those first named only stimulate metabolism and provoke diuresis. When there is pyelitis, sulphur waters often prove beneficial, such as can be obtained from White Sulphur Springs (Virginia) and Richfield Springs (New York). Hydrotherapy is contraindicated when there is a strong tendency to renal hæmorrhage; when the bladder is either very irritable or paralytic; when there is hydronephrosis, interstitial nephritis, or simple polyuria. Undoubtedly much of the benefit obtained by patients when they visit mineral springs is derived from change of climate, scene, mode of life, and freedom from care.

Frequently before prophylactic or curative treatment can be instituted renal colic in mild or severe form must be combated. I have seen mild attacks recurring every few weeks for two or three years stopped by a single catheterization of the affected kidney, and the removal of a drachm or thereabouts of uric acid sand. If the pain, which accompanies the passage of renal gravel, is slight or moderate, complete rest, counter-irritants over the kidneys, hot baths and diuretics may suffice. Morphine and belladonna administered by the mouth are usually needed to relieve renal colic. When vomiting occurs medicine cannot be given *per os*, but must be administered hypodermically or *per rectum*.

Whenever colic is severe the prime indication for treatment is to relieve pain, and a secondary one is to hasten the expulsion of the stone. So violent is the pain, and oftentimes so excited is the patient, that anæsthesia must be produced by chloroform or ether. If the pain is thus allayed temporarily, an enema of chloral or a hypodermic of morphine can be given to prolong the relief. It is usually impossible to give drugs by the mouth under these circumstances, for vomiting is frequent. Much care must be taken not to administer morphine and chloral in doses that are too large or to give them too frequently in large doses; for while the pain lasts safe quantities sometimes seem useless, but if they are given in unduly large amounts, when the pain suddenly ceases (as it often does) symptoms of poisoning develop. It is best to help out these drugs by inhalation of chloroform and ether. They not only relieve pain but relax the muscular spasm. Belladonna and stramonium are often used as adjuvants. They paralyze unstriped muscle-fibres such as partly form the wall of the ureters. They there-

fore help to relieve the colic which spasm of the ureters produces. Unfortunately, unless used in almost toxic doses they will not accomplish this. Atropine is, however, commonly combined with morphine when it is administered for renal colic. Unless a patient is anæsthetized or narcotized rest cannot be maintained provided the colic is severe. Copious draughts of water are desirable to help provoke a rapid expulsion of a stone, but often they cannot be taken because of vomiting.

HÆMOGLOBINURIA AND HÆMATURIA.

By *hæmoglobinuria* is meant the occurrence of hæmoglobin in urine in a state of solution. It gives to the latter a characteristic blood- or brownish-red color. By *hæmaturia* is meant the occurrence of red blood-corpuscles in sufficient numbers to give it a blood-color. We are now interested only in hæmaturia of renal origin. It may be due to injuries, to crushing, to a fall, or to blows upon the back or sides. It occurs in many renal disorders, in congestion of the kidneys, acute nephritis, suppurative and tubercular nephritis, renal cancer, embolism, calculi, and hydatids. Calculi and inflammation of the pelvis may also provoke hæmorrhage. It occasionally occurs in abnormal blood-states such as purpura hæmorrhagica, scurvy, and malignant fevers. It is endemic in certain localities within the tropics. Infection by *filaria* or *Bilharzia* is the usual cause in these places. In rare instances hæmaturia occurs vicariously for menstruation.

The first indication for treatment is to remove, whenever possible, the cause of hæmorrhage. Treatment of renal congestion and inflammation is often the whole treatment for individual cases of hæmaturia. When abnormal blood-states are its cause these require treatment. If menstruation is suppressed and hæmaturia is of vicarious origin, the former must, if possible, be re-established. Renal hæmorrhage due to calculus often cannot be checked until the stone is removed from the kidney by an operation. When inflammation of the kidneys, or the pelvis of them, is the cause of hæmaturia the usual antiphlogistic measures must be employed—such as cupping, leeching, rest, and counter-irritants. If inflammation is due to infection, hot baths (temperature 40–42° C.) are among the most useful measures of relief: they should be repeated daily, and sometimes twice daily. The baths are contraindicated if there is great cardiac weakness or arterial sclerosis. Cupping and leeching cannot be used safely if anæmia or cachexia are great, as they often are in cancer, tuberculosis, and grave pyrexias. When hæmaturia is of traumatic origin an ice-bag on the

small of the back and loin is especially useful, and in all cases whenever hæmaturia exists complete rest should be prescribed. Of medicines, astringents are most usually resorted to. By constricting the renal capillaries, it is hoped, hæmorrhage will be checked. Those most frequently used are tannic and gallic acids, perchloride of iron, acetate of lead, hamamelis, chimaphila, rhatany, and krameria. The first four are the most reliable; they are administered by the mouth in the usual therapeutic doses. Ergot can be given with benefit in most cases. It is commonly administered by the mouth, but may be given hypodermically when the stomach is disturbed. Its mode of action is too well known to require repetition. In hæmaturia produced by calculus, oil of sandalwood, copaiba, or turpentine will often check the bleeding when ergot and astringents fail. They are contraindicated when the renal parenchyma is inflamed.

Medicinal treatment for the endemic hæmaturia of hot countries is of little avail. Astringents, ergot, and balsams are employed, but rarely with much success. Parasiticides have proven equally useless. The best results are gotten from change of climate and constructive treatment and medication. A visit to the cooler part of the temperate zone, or, at least, to high altitudes within the tropics, is most certain to help. Hæmatics and stimulants to nutrition, such as iron, arsenic, quinine, and strychnine, are important adjuvants to climatic treatment. During convalescence sea-baths or hydrotherapy at saline and chalybeate springs prove useful. Not infrequently, although recovery is obtained by change of climate the malady will return if the patient again lives in a hot country. Those who must live in infected districts should exercise the utmost care to use only water that has been purified by boiling and filtration, and foods that are in a wholesome condition, well cooked, and prepared with cleanliness. These are most important prophylactic measures. It is also necessary to avoid excessive labor, and if one is debilitated by slight ailments to endeavor quickly to correct them, for debility from any cause predisposes to infection.

The exciting cause of hæmoglobinuria is renal congestion, but it must be associated with an alteration of nutrition which is either hereditary or acquired. The exact nature of this disturbance of nutrition is unknown. In many cases it is produced by syphilis, malaria, rheumatism, anæmia, excessive nitrogenous waste, or excessive elimination of mineral salts by the urine. The commonest cases of renal congestion are undoubtedly exposure to cold, over-exercise, or excess in venery or abuse of alcoholics. It need hardly be said that when any of these conditions are present the first object of treatment must be their removal. The usual treatment applicable to the predisposing maladies must be instituted. If excessive nitrogenous waste is

going on, a milk and vegetable diet should be prescribed and albumins should be used sparingly if at all. Any derangement of digestion that may exist should be corrected. Benzoates and salicylates will help to eliminate nitrogenous compounds in forms as little irritating as possible. Gentle exercise must be commended, but excessive exercise must be forbidden. When there is an excessive elimination of mineral salts by the urine, and consequently a diminished amount in the blood, Robin recommends a diet rich in such mineral matter, and the administration of a powder twice daily of the following complex construction :

	Gramme.
Chloride of sodium	0.3
Chloride of potassium	0.26
Phosphate of sodium	0.06
Phosphate of potassium	0.15
Glycerophosphate of lime	0.03
Glycerophosphate of magnesia	0.017
Sulphate of potassium	0.03
Glycerophosphate of iron	0.062
Hæmoglobin (powder)	0.062

When hæmoglobinuria exists or relapses are feared the patient must be protected by warm woollen garments from sudden chilling; the danger from abuse of alcoholics and excess in venery or in exercise must be explained. Complete rest should be prescribed so long as the urine is bloody. During this time a milk diet is to be preferred. As in hæmaturia so in hæmoglobinuria astringents and hæmostatics are often prescribed, but they are of little advantage, for the underlying fault of nutrition is not corrected by them.

Hæmorrhage from the kidneys is rarely fatal. It often produces great prostration, and may be an important factor in producing death. It is usually of short duration, lasting from a few hours to a week or two. In rare instances it persists for many weeks or months. In one case watched by me it lasted nearly two years and was often very considerable in amount. No treatment seemed of advantage. The patient had a similar attack some years before which lasted about six months. Recurrences of hæmoglobinuria are not uncommon. Hæmaturia, unless its cause can be radically removed, is equally liable to return.

CHYLURIA.

Chyluria is the name given to a passage of milky urine which contains a large amount of emulsified fat. An admixture of blood sometimes gives it a brown instead of yellowish-white color. Its

cause is often the same as of hæmaturia, therefore the two are commonly combined, and blood as well as chyle is found in the urine. It is often intermittent, the chyluria occurring only at night or only by day, or recurring for some days, disappearing, and not reappearing for many days. It is a condition rarely met in temperate climates, but is not uncommon in the tropics. It is due to obstruction of the chyle-channels, the formation frequently of lymphangioma, and finally the rupture of these distended lymph-vessels into the bladder, ureter, or pelvis of the kidney. In the tropics the presence, growth, multiplication, and at times probably death of the *filaria sanguinis hominis* or *Bilharzia hæmatobium* in the chyle-channels is the common cause of their obstruction. In such cases the immature parasites are discoverable in the urine. The natural tendency in many cases for the urine to lose, at least temporarily, its chylous appearance makes it difficult to judge of the success of drugs in relieving it. The treatment that has been tried and the variety of drugs employed are almost the same as for hæmaturia. In the hands of one observer one drug or combination has proved effective in a given case; another observer has had success with another, and a third has tried them all on a case without effect. I will not repeat the long list of those that have been used. The most efficacious are the following: Astringents, especially tannic acid, ergot, and perchloride of iron, either alone or with opium; the iodides and iodine. The latter probably stimulate the circulation of lymph and re-establish its movements in normal channels by removing obstructions in the chyle-ducts or mesenteric and intestinal adenoid bodies. Reconstructive measures form a third useful means of relief. A change of climate is above all things useful when the condition has a parasitic origin. Cold baths and especially sea-baths are often extremely beneficial. As adjuvants to these modes of treatment iron, quinine, and strychnine prove of value. I need not repeat what I have just written, pertinent to hæmaturia of similar parasitic origin, of the uselessness of parasiticides. Against this form of chyluria the same prophylactic measures must be instituted as for the hæmaturia.

ALBUMINURIA.

Albumin is another abnormal product which often appears in urine. Serum-albumin and serum-globulin are the forms of albumin found in albuminous urine. They may appear in the urine because of suppuration or hæmorrhage in the bladder or urethra. When they come

from the kidneys they enter the urine almost exclusively from the glomeruli. A small amount of albumin may find its way into the tubules through their walls. When there is intense congestion, inflammation, or profound degeneration or destruction of renal epithelium, always the largest amount—and often all that gains access to the tubules—comes from the glomeruli. If the blood contains an excess of albumin, or if, as Rosenbach urges, there is in it a surplus of loosely united albumin, the latter will find its way from the glomeruli into the urine. Oftener structural changes in the Malpighian bodies, the result of congestion, inflammation, or degeneration, are the causes of its appearance there. In health the serum of the blood percolates through the walls of the capillaries into lymph-spaces outside. The albumin in it is prevented from entering the renal tubules by the epithelium which covers the tufts of capillaries and lines each glomerulus. This epithelium permits the water and certain salts to enter the tubules, but retains the albumin. If, however, because of congestion these lymph-spaces are overfilled, or because of structural changes the continuity of the epithelium is broken, albumin will escape. Not very infrequently a trace of albumin appears constantly, or from time to time, in the urine of those who otherwise seem healthy. Sometimes in such cases no casts, renal epithelium, blood, or other evidences of structural disease of the kidneys can be found and upon autopsy no gross lesion can be detected. These are cases of *glomerular insufficiency*. Usually glomerular insufficiency is of a few glomeruli only, not of all or most of them. So slight may the lesion be that the function of the kidneys as organs of elimination is not interfered with, and the loss of albumin is not enough to cause weakness. These are the cases occasionally met with of albuminuria in persons apparently healthy. Renal albuminuria never occurs if the kidneys are perfectly healthy.

The following are some of the conditions under which albuminuria arises: It is rarely hereditary. Mental and physical fatigue will sometimes cause and much oftener aggravate it. Many diseases which disturb general circulation or profoundly change the quality of the blood will provoke it, such as heart diseases, exophthalmic goitre, deep anæmias and cachectic states. Often both cardiac weakness and a perverted blood-state coexist. In febrile diseases the nutrition of the kidneys, and therefore the permeability of the glomeruli, is modified. Sometimes degeneration or inflammation is the cause of albuminuria of fever. Glomerular insufficiency is produced more readily in some persons than in others. Albumin appears in the urine of a few individuals whenever they eat large quantities of albuminous food; in others it will appear only at certain parts of the day. Such cases belong to the category of cyclic or intermittent albuminuria.

The former are characterized by the appearance of albumin at a regular time daily, the latter by its irregular recurrence. In such cases albumin usually disappears from the urine at night, but reappears after two or three hours of ordinary and necessary exercise, or irregularly after more violent exercise or injudicious eating. These are forms of albuminuria that do not affect the general health of a patient and seem not to endanger life; they do signify the existence of weak kidneys, the functions of which are easily disturbed. Glomerular insufficiency increases one's liability to inflammation, and patients with it should be warned of the danger and taught the precautions necessary to its prevention. Lastly, organic disease of the kidneys causes albuminuria. Indeed, so commonly is it the cause that the existence of an organic disease can be taken for granted when there is renal albuminuria, unless it can be demonstrated that no such lesion exists.

These conditions productive of renal albuminuria give a key to its prevention and often to its cure. Some of the conditions provoking it cannot be removed, as, for instance, chronic Bright's disease. But one can guard against mental and physical fatigue and thus often prevent recurrences of albuminuria, or at least lessen its severity. Anæmias and cardiac weakness can frequently be cured, or at least so far mitigated as to stop glomerular insufficiency. In certain of the milder cases albumin can be removed from the urine by a suitable regimen, and in most cases its abundance can be lessened or augmented by changes in diet. That an exclusive milk diet is the best is almost universally admitted. I have already given reasons for its use when there is renal incompetence. When it is the chief article of food albumin in the urine usually lessens and often disappears. Unfortunately milk is not well tolerated by many patients, especially when they have chronic albuminuria, for its use is then indicated over a long period of time. In milder cases a milk diet is unnecessary, especially when there is not acute nephritis, or an acute exacerbation, and when uræmia is not threatening. In general a diet which embraces a pint or more of milk daily, and most vegetables, breads, and fruits, is permissible. A careful study of the relationship of meats and eggs to albuminuria in individual cases will enable a physician to allow many of his patients some of them. What I say now of diet should be considered with what I have said above of the regimen of the uræmic. What I say now does not apply to those threatened with uræmia, but to those having a mild albuminuria which is not associated with renal incompetence. Albuminous foods should not be taken generously at any time. The least harmful are chicken, turkey, bacon, mutton, and lamb. They are to be preferred in the order named. The most objectionable are beef and game. When meat is

eaten it should be simply cooked, without gravies. Meats are deleterious apparently in proportion as they are rich in extractives and are slow of disintegration and digestion in the stomach and intestines. It is best to study the effect of different kinds and amounts of meat in each case by itself.

Can eggs be taken without harm? This is a disputed question. Egg-albumin introduced into the blood directly or absorbed from subcutaneous tissues will undoubtedly produce albuminuria in healthy animals. Repeatedly has albumin been found in the urine of men who have eaten eggs in too large numbers at one time. This albuminuria is probably due in part to an excess of albumin in the blood, and in part to its being there in "loosely united" forms, or forms unnatural to it. On the other hand, of late, and in growing numbers, clinicians claim that eggs are among the articles of food least harmful in albuminuria. Robin[1] strongly recommends them, but urges that they be always cooked. The question of their hurtfulness must be regarded as an open one. I have permitted some patients to eat eggs and have observed no increase of albumin in their urine, but I have seen in others an apparent transient increase. It is true of eggs as of meat that their effect upon albuminuria should be studied in each case.

The physician who expects to see albumin always disappear from the urine, or lessen in it, when a patient is deprived of albuminous food will often be disappointed. Fish is usually classed among the least harmful forms of nitrogenous food. This is commonly true, and is most true of fish which is fresh and the meat of which contains only a small percentage of extractives. Fish easily spoils or undergoes changes that make it less fit for albuminurics than for healthy people to eat. Farinaceous foods are permissible. They embrace breads, potatoes, turnips, beets, rice, farina, cornstarch, etc. Spinach, peas, and beans are unobjectionable. Usually cabbage, lettuce, asparagus, and tomatoes can be taken. Sometimes the last is contraindicated because it contains oxalic acid, and the others because they are rich in potassium salts. Fruits may be permitted and are most welcome to those who must be dieted strictly.

No beverages are so good as pure water (distilled usually to be preferred) and milk. Tea and coffee in very moderate amounts can be permitted in mild cases. Alcoholics, even the mildest and no matter in how small amounts, are contraindicated. They are irritants to the kidneys and aggravate lesions which produce albuminuria. If given to those who have glomerular incompetence they will increase it. Koumyss is contraindicated because of the alcohol it contains. Matzoon can be used as a food, but it is in no sense a substitute

[1] *Traité de Thérapeutique*, 1896, fasc. ii. p. 98.

for milk in the treatment of these cases. When milk is the only article of diet at least three or four pints should be taken daily.

A number of medicines are employed to lessen the excretion of albumin. As a restricted diet often fails, so do these medicines. The quantity of albumin passed from the kidney is rarely enough in itself to do much harm. It is not necessary in cases of structural disease of the kidney to address medication to the albuminuria *per se*. When albumin is voided in unusually large amount, and when it is voided without apparent renal lesion, it requires treatment. Astringents, given by the mouth, have been chiefly relied upon, such as tannic acid, sodium tannate, hydrastin, uva ursi and its active principle arbutin, and chloride of iron. It is supposed that these do good by affecting the capillaries of the glomeruli. Fuchsin in doses of 2 to 4 grains has been used and lauded by many authors. The lactate of strontium was introduced into medicine by Germain Sée for albuminuria. It is given in doses of 15 to 30 grains three or four times daily. It has been claimed to greatly lessen the elimination of albumin by the kidneys. It is chiefly indicated in chronic albuminuria, and should not be used when there is much danger of uræmia or much fever. How either fuchsin or the lactate of strontium do good is not known. All these remedies I have tried most patiently and in all kinds of cases, but so rarely with appreciable results that I am compelled to trust more to regimen than to medication for the relief of albuminuria. Digitalis, strychnine, and ergot have been employed with the hope that their contraction of the minuter blood-vessels might check the escape of albumin. By increasing blood-pressure they often increase diuresis, and therefore lessen the percentage of albumin in the urine. If they are given in full doses they produce albuminuria in health and increase it when there is renal disease. They act just as ligature of a renal artery does. Cantharides and other irritating diuretics have been used in albuminuria. There is, however, so much danger of provoking nephritis or of aggravating it by them that I am unwilling to use or recommend them. The acetate of lead has been employed, but it is also a provoker of nephritis. If used at all it should be only temporarily, and certainly never by individuals who are gouty or have uric acid diathesis. The astringent properties of this drug are those that commend it.

Drugs which are directed to limit the escape of albumin in the urine are relatively inefficient. Treatment to be efficient must be dietetic and aimed to remove the cause of albuminuria. Therefore the directions just given must be coupled with those especially needed for the treatment of passive congestion, inflammation, and degeneration of the kidneys.

DIMINISHED URINATION.

As the water of urine and the salts which it contains are, for the most part, excreted through different structures, the ratio between them, day by day, may vary greatly. The excretion of fluid depends upon difference of pressure in the vessels of the glomeruli and in the renal tubules, while the excretion of urea and other so-called solids depends upon the vital activity of the cells lining the convoluted tubules. Although these structures may act independently, and commonly do when the kidney is healthy, the function of both is, in disease, usually lessened simultaneously. A moderately copious flow of urine is essential for the removal of all the solids that need elimination. Therefore a partial suppression of solid excreta occurs whenever the quantity of water eliminated is much diminished. If the kidneys fail to perform their functions, death occurs. It is not produced suddenly. Several hours and sometimes days are necessary for its accomplishment. It is due to intoxication by substances which accumulate in the blood and nervous tissues when they are not eliminated by the kidneys. This intoxication is gradually developed, for time is necessary to accumulate the poisonous excreta to a fatal dose. A case which illustrates well the slow development of fatal poisoning was recently under my observation at Mercy Hospital. Cancer of the bladder caused complete obstruction of the ureters. This was known to exist for at least eight days before death occurred.

Complete and Partial Anuria. All degrees of *lessened renal activity* may be observed, from complete suppression to a very slight diminution of the quantity of urine. To have the glomeruli inactive is of little import, and is always a transitory phenomenon, unless the function of the other renal structures is simultaneously modified. It is, however, important to know how the function of the glomeruli can be increased, as it often must be, in order to rid the body of dropsical accumulations or extensive inflammatory exudates.

The quantity of urine is lessened when the blood-pressure in the renal vessels is low and when the renal tubules are obstructed. These changes may be effected by a variety of morbid conditions, which it is the duty of the therapeutist to remove or modify. The blood-pressure is low whenever the heart is feeble; whenever dilatation takes place in large vascular areas, as, for instance, in the intestines; and whenever contraction of the renal artery or vessels afferent to glomeruli occurs. These latter changes almost never occur, for the morbid states which cause contraction of renal vessels cause contraction extensively in other than the renal vessels, and therefore raise blood-pressure and provoke diuresis.

It is conceivable that the splanchnics may be excited by neighbor-

ing inflammation or by pressure of tumors or contracting tissues, and thus provoke contraction of renal vessels. Such lesions are so much more apt to destroy these nerves that the opposite result, dilatation of renal vessels, is the rule. Dilatation in large vascular areas, as in the skin or intestines, occurs sometimes in the former from exposure to heat, in both from sudden congestion due to the application of irritants which may ultimately produce inflammation. It may be caused by some medicines, as by those which provoke intestinal congestion, or by paralysis due to injury of the medulla, spine, or splanchnics.

Whenever inflammation occurs in a kidney the function of the organ is modified by both vascular and tubular changes. The current in the inflamed capillary tuft is slow. The glomerulus is filled with serum in which a few corpuscles float. The difference of pressure within the capillaries and outside them is slight, therefore diuresis is lessened. At the same time many of the renal tubules are obstructed by casts, loosened epithelium, and granular matter, the result of disintegration of cells. Other tubules are lessened in calibre by the swelling of epithelial cells lining them, and by congestion and œdema of the surrounding interstitial tissues. All of these changes tend to lessen diuresis. When the epithelium has been extensively loosened and lost, and the tubules enlarged in calibre, the flow of urine is augmented unless vascular changes prevent it.

Another factor entering into the complex process of inflammation that tends to lessen the flow of urine is inflammatory œdema. It causes fluid to find its way into the tubules in considerable quantity through the interstices of the epithelium, and helps to fill the tubules, increases the pressure of fluid in them, and therefore lessens filtration through the glomeruli. When cirrhosis develops in kidneys diuresis is increased, for only small areas are involved in inflammation at one time, and in the other comparatively healthy parts blood-pressure is raised, as it is in the arteries of the body generally. Therefore, although little by little the renal tissues may be extensively destroyed, the healthy portion excretes an unusual quantity of fluid so long as the heart retains its strength and maintains high arterial tension.

When there is general œdema, not infrequently the kidneys become dropsical. The flow of urine from them is then greatly lessened, both because of pressure of the distended interstitial tissue upon the tubules and because of the partial filling of the tubules from the lymph-spaces, as just explained in inflammatory œdema.

Passive congestion of the kidneys, due to cardiac or pulmonary diseases, or to pressure upon the renal veins by tumors or cicatricial tissue, is a common cause of diminished diuresis. When this lesion is fully developed, the secretion of urine is lessened, as it is in ne-

phritis. Congestion of the tissue about the tubules tends to narrow them; the cells lining them swell and lessen their calibre still more; often casts and loosened cells fill and obstruct them. Transudation of serum from the surrounding capillaries into the tubules fills them and lessens the difference of pressure within them and the glomerular vessels, which also checks diuresis. Œdema is commonly associated with passive hyperæmia of the kidneys.

Another occasional cause of diminished flow of urine is the presence of an obstruction in the ureters. This may be a stone, compression by cicatricial tissue outside of them, or pressure of tumors or misplaced organs upon them. When the kidneys themselves are movable a kink or sharp bend may partly or completely obstruct the ureters.

Sudden and complete suppression of urine may be due to embolism of both renal arteries; an accident of most infrequent occurrence.

Suppression of the function of the kidneys produces an accumulation of waste products in the blood which are abnormal in considerable amount, and some of which are extremely poisonous to the central nervous system. These substances are produced in small part by the metabolism of living cells, but chiefly by fermentation in the stagnant contents of the intestines or by foods directly. Salts of potassium are absorbed in large amounts, and become poisonous when they accumulate in the blood. Various nitrogenous substances, which are always present in the blood in moderate quantity, are toxic when accumulated there in considerable amounts. They are derived in part from nitrogenous food and in part from waste of tissues. Some of these latter substances require modification by the liver that they may be made eliminable in the urine or in the bile. The liver should prevent most of the products of intestinal fermentation from entering the general circulation. Unfortunately, in many of the diseases in which the kidneys are inactive the liver is so also, and therefore the opportunity for the accumulation of toxic matter in the blood is increased.

URÆMIA.

The most striking symptoms of renal insufficiency grow out of the effect of retained poisons upon the nervous system. A diminished excretion of urine, or of urinary solids, generally escapes attention until striking nervous manifestations develop. If the onset of renal insufficiency is sudden or rapid, the symptoms of acute poisoning, *acute uræmia*, are displayed. If, as happens quite as often, the

insufficiency is of slow and gradual development, the nervous system becomes in part habituated to or tolerant of the poisons, and the symptoms are those of *chronic uræmia*.

Convulsions or coma, or both together, characterize acute uræmia. These symptoms may develop suddenly without premonition, or they may be preceded by some of the phenomena of chronic uræmia. Convulsions rarely occur without coma, although the latter is sometimes not deep. Coma without convulsions is of much more frequent occurrence. In most cases stupor or unconsciousness exists in the intervals of quiet between successive convulsions. The latter also vary much in severity. They may be limited to slight twitching or may be violent generalized movements. Death occurs especially when the convulsions are violent because they interfere with respiration. Coma may be deep from the start, but oftener begins with drowsiness and deepens into stupor and unconsciousness. The pulse and temperature are commonly unchanged. When convulsions are violent the temperature sometimes rises temporarily. The pupils may be large, small, or normal.

Symptoms of chronic uræmia are manifold. They often consist in periodical headaches; in anorexia, or nausea and vomiting, or diarrhœa; in respiratory disturbances, such as asthma and Cheyne-Stokes respiration; in sudden temporary blindness or deafness; in formications and numbness; rarely in delirium either maniacal or muttering. At times in the breath of patients and in exhalations from their bodies a urinous odor is detectable. In uræmia the quantity of nitrogenous matter voided by the kidneys in twenty-four hours is always lessened, although its percentage in samples may be high at certain times in the day. Usually the total quantity of urine voided is diminished, but in chronic interstitial nephritis it may exceed a normal average, although the excretion of waste is diminished. In treating uræmia it must be constantly remembered that the condition of the kidneys alone rarely produces the intoxication, but simultaneous derangement of the liver and unwholesome fermentation of the contents of the alimentary tract helps to cause it.

In order to avert suppression of urine either partial or complete its causes must be borne in mind. The conditions which lead to the anatomical changes provocative of renal insufficiency must be removed. As renal congestion and inflammation are especially apt to occur in infectious diseases they must in such cases be averted. Preventive measures consist in protecting the skin against sudden chilling by woollen garments and warm clothing. Attention must be directed to this especially during convalescence from infectious diseases. In the period of fever exposure is rarely harmful, but during convalescence, when the body is weak and reaction to cold takes place slowly,

congestion and acute inflammation of the kidneys are common. In order that the chemical changes of nutrition may be as perfect as possible, and waste products as thoroughly eliminated by the lungs as they can be, it is best that the patient's room be kept cool and the air in it fresh. During convalescence from those diseases which are oftenest complicated by nephritis and uræmia, patients should be kept unusually long in bed and in one room. It is quite as essential that the skin be kept clean as that the lungs should be filled with fresh air. Frequent bathing is therefore necessary. The mouth and other cavities of the body should also be cleansed in order that toxic matter may not be absorbed from them. The bowels must be emptied regularly and freely. The importance of free catharsis under these circumstances is better appreciated when it is remembered that the toxins which produce uræmia are chiefly derived from the intestinal tract. Foods which easily ferment must be avoided, as well as those which are rich in potassium salts and extractives. Alcoholics should be forbidden because they are irritating to the urinary channels and because they interfere with normal tissue-change. Water should be taken copiously. If uræmia threatens or exists in a mild form, abstinence from food for a few hours, or even one or two days, the use of water freely, and a prompt, copious purge will often cause all traces of the malady to disappear.

Whenever albumin is present in the urine and uræmia is evident or justly to be feared, food, if it must be taken, should consist exclusively of milk. It is best because it leaves in the intestines a residue that is only slightly toxic and little liable to become so. It is also a diuretic of the first order, promoting greater activity both of renal epithelium and glomeruli. So long as uræmic symptoms exist other albuminous foods should not be taken. If uræmia has subsided, meat, fish, and eggs ought not to be eaten for some days—not until a copious excretion of urine of fairly normal character has been established. A milk diet is not well tolerated by many patients, and cannot be rigidly adhered to. It can be varied by the use of farinaceous foods and fruits. But even when such articles are permitted, milk should form the chief ingredient of the diet. And it must be remembered that in proportion as food is varied the danger of fermentation within the alimentary tract increases, and therefore the danger of producing toxins increases.

I have so frequently seen complete abstinence from food, with copious bowel movements, relieve mild uræmia that I can strongly recommend such practice if patients are sufficiently vigorous to bear starvation for a time. Within a few weeks I have seen two patients undoubtedly relieved of uræmia in this manner. I recall well the case of a woman suffering from maniacal uræmia who was

completely relieved when she was deprived of all food except water for forty-eight hours and copious catharsis was provoked by pills of elaterium. Another patient who was in great distress because of Cheyne-Stokes respiration, anorexia, and vomiting was relieved after other modes of treatment—mild cathartics, diuretics, and diaphoretics —were tried with little avail, when even a milk diet was stopped, and freer catharsis provoked by salines. All gastric and respiratory discomfort was for the time relieved.

In those diseases liable to complication by renal insufficiency, chemical antipyretics should be avoided, for even more than alcohol do they interfere with proper tissue-change. They destroy the oxygen-carrying power of blood in proportion to their efficiency as prompt febrifuges. Cold baths are not, however, contraindicated in the same way. Febrile diseases treated by them are found to be infrequently complicated by renal disorders. They provoke healthier tissue-change, stimulate circulation, promote diuresis, and under their influence the urine becomes more nearly normal.

When uræmia exists, complete rest should be enjoined, but when it is feared rather than present, gentle exercise is to be commended, for it promotes more perfect metabolism and helps to eliminate from the tissues the products of their own waste which are often toxic to them. Massage and passive movements must sometimes be prescribed for those who are too feeble to take active exercise. But exercise should never be exhausting or very fatiguing.

If renal congestion causes either acute or chronic uræmia it should be lessened by (*a*) bleeding whenever the patient is strong. More of poisonous matter can be rapidly removed from the blood by this than by any other means. If blood is abstracted by leeches placed on the loin between the lowermost ribs and the crest of the ilium, and between the outer edge of the oblique muscles of the abdomen and latissimus dorsi, congestion of the kidney can be directly influenced, as the superficial vessels in this area anastomose with the renal. If, however, uræmia is mild, one may safely trust to (*b*) depletion by the intestines, and to (*c*) cardiac tonics which can relieve renal congestion by promoting a more vigorous circulation and higher general blood-pressure.

When nephritis exists an attempt must be made to keep the renal tubules permeable.

The stomach and intestines must be kept clean and fermentation in them must be lessened. The dietetic regimen already described will help to accomplish this. Gastric and intestinal antiseptics must be used with caution, for most of them are eliminated by the kidneys, and are more or less irritating to them. This is especially true of carbolic acid, resorcin, and naphthol. The preparations of bismuth are the

least harmful, especially the subgallate and subnitrate. Bouchard has strongly recommended large doses of charcoal to absorb or modify many of the toxic compounds produced within the alimentary tract by fermentation and thus to prevent their entering the blood. Cathartics are essential to cleanse these organs. Salines usually are sufficient. They should be given in concentrated form when the stomach is empty, and no fluid should be taken until after they have moved the bowels, if it is desired to deplete the kidneys and to promote vicarious elimination of waste matter from the blood. Calomel is also a useful purge. It is at the same time an intestinal antiseptic and diuretic of value. It cannot be used day after day, for it will produce salivation and may even irritate the inflamed kidneys. It is rather to be resorted to from time to time. If one aims to promote vicarious elimination as well as to cleanse the bowel, the best results are obtainable from elaterium and similar drastics. They, however, soon produce intestinal distress and must be discontinued. They can be employed most advantageously during the first day or two of severe uræmia. If it is relieved the bowel can be kept clean and more moderate depletion maintained by salines.

Vicarious elimination by the skin is quite as essential as by the intestines. To promote as vigorous action of it as possible, heat should be applied to it. Patients having chronic uræmia who are still fairly strong generally prefer a hot bath. They should be completely immersed in water as hot as can be borne and should be kept in the tub fifteen or twenty minutes. When they leave the water they should be rapidly dried, briskly rubbed, and put at once to bed under woollen blankets and warm comforters, in order to maintain diaphoresis for some time longer. Such baths may be repeated daily, or at longer intervals, as seems needful. If a patient is comatose or too feeble to be taken from bed a hot-air bath in bed is best. If, before heat is applied, the skin is briskly rubbed for a few minutes sweating is provoked more quickly. The patient should be covered with the warmest bedding and under it hot air from an oil lamp beside the bed should be conducted by a section of bent stove-pipe. Copious sweating can be thus provoked with ease, and can be maintained for a half-hour or more as seems best.

Pilocarpine, when administered hypodermically or internally, will also produce free diaphoresis, but it so often produces distressing salivation and cardiac weakness that it is rarely used except in extremely urgent cases and when the heart is strong. Recently its employment endermically has been commended. Five centigrammes mixed with one hundred grammes of lanolin or vaseline, rubbed thoroughly over the body and legs will cause copious sweating, especially if the patient is immediately wrapped in wool. The pilocarpine

acts directly upon the glands of the skin. None seems to be absorbed, and consequently no bad effects are produced by it when used endermically. This method of administering pilocarpine I have tried and have found it successful.

The skin should be kept in an active state and clean even if actual sweating is not deemed necessary. Gentle rubbing and warm or plunge or sponge baths will accomplish this. They can be used daily or nearly so with advantage.

One other drug is employed with the hope that it will modify any abnormal metabolism that may exist. I refer to oxygen. I have never been able to convince myself that its inhalation did good unless respiration was impeded. Theoretically, if the bronchial tubes and lungs are unobstructed, we can expect the blood to take up no more oxygen when it is inhaled pure than when it is diluted as it is in air. If, however, breathing is difficult and the blood must be oxygenated in a small portion of the lungs only, pure oxygen will contribute greatly to the comfort and well-being of the sufferer. It is of utility when Cheyne-Stokes respiration is distressing, and of still more assistance if there is uræmic asthma or pulmonary œdema.

Uræmic disturbances of respiration often form indications for special treatment. Cheyne-Stokes respiration, which is observable frequently in uræmia, is best relieved by the general treatment already outlined. Its intensity can often be lessened, and therefore the weariness and distress which it causes be mitigated, by full doses of bromide of sodium, chloral, or opium. The first two are to be preferred. The latter is to be avoided if possible, because it lessens diuresis, dries the skin, and diminishes the functional activity of most glands. These drugs produce their good effects by benumbing the central nervous system and making it less susceptible to the poison of uræmia. They are also useful when asthma is a uræmic phenomenon. The nitrites can be employed both in asthma and Cheyne-Stokes respiration. They undoubtedly act chiefly upon the motor nerves, and especially upon their termini in muscles. By lessening the irritability of these structures the muscles are less liable to be thrown into spasm or their rhythmical action to be modified. Dilatation of the vessels of the medulla plays a part in effecting the relief which these drugs afford to Cheyne-Stokes respiration. Nitrite of sodium and nitro-glycerin are to be preferred, for their effects are more persistent than those of nitrite of amyl: 1 to 3 grains of the first can be used, and from $\frac{1}{200}$ to $\frac{1}{50}$ of the second. These doses can be repeated hourly for a few times if necessary, but generally need not be employed more than three or four times daily.

Anorexia and vomiting are not infrequent uræmic symptoms. Both are best relieved by the treatment already outlined for uræmia.

Whenever the patient's strength will permit, abstinence from food, the ingestion of an abundance of water, and free catharsis give quicker relief than can be obtained by any other mode of treatment. Cleanliness of the alimentary canal is of importance in all uræmias, but of the greatest in those cases in which gastric symptoms predominate. Abstinence from food can only be maintained for a short time, therefore diet is all-important. Milk, or, if it be vomited in large curds, a modified milk made of cream and milk-sugar with a small proportion of skim-milk and enough lime-water to make it slightly alkaline, may be used advantageously. It is best given in small quantities, one or two tablespoonfuls, every hour at first. So soon as it is demonstrated that the stomach will tolerate it the quantity should be increased. If possible, a strict milk diet should be adhered to. If this is impossible, gruels may be substituted. The diet must be the same as for uræmia, but food must be more carefully administered. Such anti-emetics as carbolic acid, resorcin, and sulphocarbolate of zinc are contraindicated because they are irritating to the kidneys and may increase the renal inflammation. Indeed, if used, they seem to produce little effect. Cerium oxalate and preparations of bismuth can be employed without danger, but in vomiting of uræmic origin they do little good. Opiates will often lessen the irritability of the stomach. I have seen this illustrated very recently in two cases. An attempt was at first made to relieve persistent vomiting by the common treatment of uræmia. Anti-emetics were employed unavailingly, but 10-drop doses of paregoric, repeated hourly three or four times, gave relief in one case; a single dose of morphine, $\frac{1}{8}$ of a grain, gave relief in the other. Unfortunately, opiates lessen the excretion of urine and increase the danger of profound uræmia. They must therefore be used with caution and only temporarily.

Not infrequently persistent diarrhœa is a uræmic symptom. If it is not too severe and exhausting, it is rather a benefit than a detriment to the patient. It is probably a spontaneous attempt at vicarious elimination of uræmic poisons. It, however, often becomes exhausting and must be controlled. If opiates are employed at all in such cases they must be used with caution. Whenever it is possible the enteritis should be controlled by astringents only.

Maniacal uræmia rarely requires special treatment. Deep congestion of the meninges has been found in most fatal cases of this kind. It is probable that the brain-symptoms are in part the result of it. Bleeding does good by withdrawing both poison from the system and blood from the brain. The meningeal congestion is perhaps most certainly relieved by leeches applied behind the ears. Veratrum and aconite also help it by relaxing the peripheral arterioles.

PASSIVE RENAL CONGESTION.

Passive congestion of the kidneys is produced usually by uncompensated cardiac disease, less frequently by diseases of the lungs which cause obstruction to pulmonary vessels, and thereby provoke overwork and exhaustion of the heart. Diseases of the liver, such as cirrhosis, which are accompanied by destruction of hepatic vessels may also produce the lesion. In rarer instances compression of the renal veins by tumors, the gravid uterus, or cicatricial tissue, and thrombosis of them, are its cause.

Passive hyperæmia leads to distention of the veins and capillaries between the tubules and in the glomeruli. When congestion is produced rapidly and is considerable, hæmorrhages into the connective tissues and glomeruli are numerous. The tubules are compressed by the dilated vessels which surround them and in part are blocked by blood-corpuscles which accumulate in them. In such cases the kidneys are rapidly enlarged. When congestion develops slowly hæmorrhages are rare and small, but capillaries are distended and those within the glomeruli are often ruptured, as is the epithelial lining of the Malpighian bodies, which permits the escape of albumin and often of a few blood-corpuscles. From the intertubular capillaries a serous exudation takes place which produces slight dropsy of the connective tissue. The epithelium of the tubules is at first swollen and later usually degenerated by albuminoid or fatty changes in it. When such congestion is of very long standing the interstitial tissues undergo hyperplasia. This begins just beneath the cortex, about the interlobular vessels, and sometimes spreads deeply into the kidney. When it is considerable atrophy appears, or at least loss of function occurs in the many glomeruli and tubules included in the newly forming cirrhotic tissue. Whatever be the degree, acuteness, or chronicity of the lesion, secretion of urine is diminished both by the circulatory changes and by the narrowed calibre of tubules and obstructions to them by such impediments as blood-corpuscles and tube-casts which are formed when the renal epithelium is much diseased. Glomerular insufficiency, which always occurs in a greater or less degree, produces albuminuria and more or less hæmaturia. The urine may be scant and concentrated, a normal excretion of waste taking place, but oftener the renal epithelium is so involved as to be incapable of performing its full excretory function.

When passive congestion exists, the first attempt at treatment should be to remove its cause. This can often be accomplished by treating cardiac asystole. If, however, structural changes in the liver or compression or obstruction to the renal veins are its cause, a removal of it cannot always be effected. Other conditions than cardiac

feebleness are important in the production of passive congestion of the kidneys even when heart disease exists. For the congestion comes and goes and again returns, although the strength, size, and other conditions of the heart vary little. Moreover, in a given case, at one time we observe passive congestion of the kidneys, at another of the liver. Something else than cardiac weakness may cause it to appear at one time in one organ and at another in the other. Just what these conditions are, we do not know.

There is not much danger of uræmia unless nephritis is developed upon the passive congestion. When the alimentary canal contains much toxic material, and the liver is not doing its work well, intense passive congestion may cause uræmia. To avert nephritis as well as uræmia, it is best when passive congestion exists to prescribe a milk diet, to cleanse the stomach and intestines by provoking vigorous peristalsis and free catharsis.

It is important that the secretion of urine be made abundant. Three to four litres of milk daily will usually accomplish this. However, it is often necessary to supplement the action of milk. The citrate and acetate of potash and similar salts are extremely useful, especially when tube-casts and blood-corpuscles are numerous in the urine, for by making the urine alkaline they help to prevent the formation of casts, and to carry into solution the detritus of degenerated cells. In this way they make the renal tubules more permeable. They are also especially indicated when the excretion of nitrogenous matter is lessened, for they directly stimulate the renal epithelium. Lactose, as Germain Sée has pointed out, can also be used with advantage, particularly when milk is not well tolerated. It is administered in solution: 100 grains of lactose in 2 litres of water, the whole to be taken in divided doses during twenty-four hours. It is at times found helpful to add to this solution the acetate of potassium. Lactose especially stimulates the function of the glomeruli. Glucose is nearly, if not quite, as efficient as lactose. Calomel is frequently used as a diuretic. It is sometimes given in moderately full doses, two or three grains daily, for one or two days, at intervals of a week; or in chronic cases in small doses, a fraction of a grain two or three times daily, and continued for one or two weeks. When given in large doses it is usually purgative and depleting as well as diuretic. Just how it produces its diuretic effect is not fully demonstrated—probably, as Locke[1] has suggested, it increases the amount of urea in the blood; and no diuretic is more powerful than urea. Furthermore, calomel does good by stimulating the liver which is often functionally inactive when the kidneys are congested, by hastening the evacuation of the upper portion of the intestinal canal, and by acting in it as an antiseptic.

[1] *Practitioner*, xxxvii. p. 170.

Thus it prevents the formation and accumulation of toxic matter, or substances often irritating to the kidneys, in the intestine, and hastens their transformation into inert substances by the liver.

An attempt to lessen the congestion of the renal vessels can often be made with advantage. It is rarely necessary to resort to cupping or leeching the loins unless the congestion is very intense and suddenly developed. But a calomel or saline purge is often of value. Drugs such as digitalis and ergot are given to increase arterial pressure, to thereby force blood through the distended capillaries and veins in more nearly normal quantities. Digitalis is especially indicated when there is cardiac asystole because of its effect on the heart as well as on the blood-vessels. Ergot may be used in the same cases, but seems to be most indicated when passive congestion is due to causes within the abdomen rather than to the heart. Ergot contracts the muscle-fibres in the walls of veins as well as of arteries, and therefore tends by direct action upon the veins to relieve passive congestion.

The iodides of sodium and potassium are employed to favor the flow of lymph from the distended intertubular lymph-spaces. The iodide of potassium strengthens the systole of the heart, lessens general blood-pressure, and therefore makes it easier to effect a balance of arterial and venous blood.

NEPHRITIS.

Acute congestion of the kidneys is so usually the first stage of acute nephritis that it is best considered as a part of it. In rare cases it develops and disappears before the inflammation is established. It is then a very transitory affection. This may occur in poisoning by such renal irritants as cantharides, turpentine, and similar drugs, or in poisoning by toxins generated in such infectious maladies as scarlet fever, diphtheria, and pernicious malaria.

As in the lungs or respiratory passages, inflammation in a kidney may affect only certain portions or structures of the organ, or affect them chiefly. Usually all the structures are somewhat modified, but either the glomeruli or the tubules or the interstitial tissues are chiefly affected. When renal inflammation is *acute* it produces *glomerular* or *catarrhal nephritis.* In the first instance the glomeruli and tissue immediately about them are almost exclusively modified; in the second the epithelium of the renal tubules is chiefly changed. When it is chronic two forms are clinically recognizable; chronic diffused or parenchymatous nephritis, and interstitial nephritis or renal

cirrhosis. The former sometimes follows acute nephritis, and sometimes arises as a chronic affection. It is characterized chiefly by degenerative rather than inflammatory changes. In chronic interstitial nephritis all tissues of the kidney are involved, but the interstitial tissues are so much increased in amount that they form its most striking anatomical feature.

The effects of acute congestion and acute inflammation are to lessen the outflow of urine, to change its character, and, when inflammation is at all intense, to produce general anæmia and œdema, sometimes also uræmia in its varied forms. Pyrexia rarely accompanies acute inflammation of the kidneys, and is not high or of long duration.

The urine is lessened because the glomeruli and tubules are choked, and the latter often are also compressed. The glomeruli are filled, especially when the nephritis is of the glomerular variety, with desquamated epithelial cells which accumulate within Bowman's capsule so as to compress the tuft of capillaries. The latter are usually distended, as far as compression will permit them to be, with blood. Extravasations of it also often partly fill the enlarged glomeruli. In other cases the glomeruli and peri-glomerular tissues are filled with leucocytes which compress the capillaries, distend Bowman's capsule and crowd the lymph-spaces in the surrounding tissue so as often to compress the adjoining renal tubules. It is easy to comprehend how such glomerular changes will make the urine scant. Before they develop, the afferent vessels and glomerular capillaries are usually deeply congested.

When there is acute catarrhal or parenchymatous inflammation the renal tubules are choked partly by blood from the glomeruli, providing very acute congestion precedes the inflammation, and by the epithelial cells so swelling as to nearly close the tubes. At the same time the cells become granular and loosened from the wall of the tubules. When thus loosened, and sometimes even before they have been cast off, they disintegrate. They and the granular detritus produced by their disintegration block the tubules completely in places. The calibre of the tubes is also partly obstructed by numerous casts which are elaborated from cells undergoing disintegration or degeneration. These are the most important ways in which occlusion of the tubules is produced, but congestion of the vessels between the tubules, distention of the lymph-spaces there, helps to cause it. These changes are most pronounced in and about the convoluted tubes and in the mild cases are confined to them. Both glomerular and tubular changes coexist, but in individual cases one may greatly predominate over the other. If acute catarrhal inflammation lasts for two, three, or more weeks the tubular epithelium becomes more coarsely granular and the cells disintegrate in larger numbers, filling the tubes with granules of fatty

matter, for it is fatty degeneration which the cells undergo. In some cases, at this stage, just under the capsule of the kidney and about the interlobular vessels small areas of cirrhosis form. The period of degeneration may be prolonged over months and constitute one form of chronic parenchymatous nephritis. It is still the convoluted tubules which are chiefly affected. It is important to note that only a few of the cast-off cells, and a small amount of extravasated blood and granular débris finds its way into the loop of Henle. It is rare that any can be discovered in the ascending arm. So much of these substances as is recovered from the urine comes mainly from the tubules below the narrow loop of Henle. A little must find its way through, especially if the urine is alkaline and the granular matter and casts are thereby made more soluble and smaller. When recovery takes place the fat-granules are absorbed and fill the lymph-spaces in the interstitial tissues; new epithelium is rapidly reproduced; the glomerular lesions also disappear, and repair may ultimately be perfect.

The urine is changed in character by the presence in it of abnormal ingredients and by diminished amounts of normal ingredients. The abnormal ingredients are albumin, blood, casts, and epithelial cells. The relative proportion of these various ingredients in the sediment of the urine gives one a key to the character of the renal inflammation in a given case. If blood-corpuscles and blood-casts are especially abundant we can justly conclude that congestion is great and hæmorrhages numerous. If epithelial casts and loose epithelial cells form the bulk of the sediment we know that it is a catarrhal nephritis with which we have to do. If albumin is abundant, casts moderate in number and mostly hyaline and granular, red blood-corpuscles present in small or moderate amounts, and epithelial casts and cells almost or quite wanting, we can conclude that the case is one of glomerular nephritis.

Urea, uric acid, and other soluble bodies usually excreted in the urine are diminished in amount whenever the renal tubules are much affected. As the urine is commonly much diminished in amount, the percentage of these ingredients in it may be increased, although in twenty-four hours they may be eliminated in amounts much less than normal. We possess no evidence so good as this of the extent to which the kidneys are involved. If a normal amount of urinary excreta is found, although the quantity of urine is small, we know that the epithelium is for the most part intact and doing its work.

These symptoms are guides in applying drugs to the treatment of nephritis, and will help to explain their mode of action. The suppression of urine leads to, or may threaten, uræmia. Coincidently the modification of the blood and of the normal functions of capillary

walls produces dropsy. Pericardial, pleural, or pulmonary œdema may cause or materially aid in causing death. Nephritics are especially liable to bronchitis and pleurisy, which are also at times fatal complications. The first indication for treatment is to guard against these complications. Rest in bed and a uniform temperature about the body are of the greatest importance to accomplish this. If, with such care, a suitable diet is prescribed, many of the mildest cases can be conducted to recovery without medication. Exercise will so augment waste products in the blood that the danger of uræmia is increased. Dropsy can also be made to disappear more promptly if one is in a recumbent position. A safe rule is, therefore, to keep a patient in bed so long as the daily flow of urine is less than normal, and so long as there is œdema. It is of great importance that the skin be not suddenly chilled and that its function of elimination be encouraged. The temperature of the room in which acute nephitis is treated should be kept at from 70° to 74° F. The air is to be kept fresh by ventilation. The patient must be protected from draughts. Woollen clothing next the skin helps to protect it and to encourage its functional activity. To promote the latter, either warm tub- or sponge-baths are useful. They should be followed by brisk rubbing which will both dry the skin and make it glow.

The diet must be such as the prevention of uræmia and the existence of albuminuria demand. This has already been described. When a patient first comes under treatment it is best to withhold all food for twenty-four or forty-eight hours, to give water freely, and to empty the alimentary canal by purgation. Milk is to be used exclusively if possible. When the quantity of urine becomes normal and the sediment in it is small, bread, farinaceous foods, some of the simplest vegetables, and fruits can be gradually added to the diet. So long as milk is well tolerated by a patient, other albuminous foods should not be eaten while there is albuminuria. When the urine no longer contains this ingredient cooked eggs can be tried, then the breast of squab and chicken, fresh oysters or fish, and cold boiled ham. Such foods should be taken in small portions only, and rarely more than once daily. Beef, game, and other nitrogenous foods rich in extractives should not be eaten until recovery is established. As the diet is varied more attention must be paid to the quantity of fluid drunk. The amount of milk taken will naturally lessen, but water must be prescribed in its place to maintain free diuresis.

It is rare that milk is altogether rejected by patients. They can usually be taught to drink it if it is at first administered in doses of a few spoonfuls. When something must be substituted for it reliance must be placed upon gruels. A varied diet must be begun earlier than when milk alone is used.

To increase the flow of urine requires that (1) renal congestion be relieved, (2) the tubules be kept permeable, and (3) absorption by the renal lymphatics be promoted. In severely acute cases of nephritis active congestion may cause almost complete suppression of urine, aching in the back and loins, and usually mild or pronounced uræmia. Local depletion, and in the severest cases venesection, are the most efficacious means of relieving congestion. It is rare that bleeding is necessary. It can be best effected by moist cups or leeches. In milder cases dry cups and fomentation are sufficient. Fomentations alone will answer in the mildest cases. Poultices should be large so that they will cover the back from the shoulder-blades to the sacrum and come around the sides of the abdomen.

When the urine is very scant, highly albuminous, and bloody, digitalis is indicated. It will increase the flow of urine by increasing blood-pressure, and will contract the vessels, lessen hæmorrhage and the escape of albumin. Ergot, the perchloride of iron, and other astringents are rarely required in cases in which hæmorrhage is great.

Congestion can also be relieved by catharsis. Salines or calomel purges should be given at the onset and repeated daily or frequently. They aid in relieving renal engorgement, in preventing and relieving uræmia, and in removing dropsies.

It is most necessary to help to keep the renal tubules permeable in cases of acute catarrhal nephritis, for in these the tubules become most blocked with epithelium, casts, and the detritus of disintegrated cells. In cases of glomerular nephritis obstruction to the tubules is less, but not wanting. By keeping the urine alkaline, casts are formed in smaller numbers, are partly dissolved, and much of the granular matter is carried into solution. Alkaline diuretics will make the urine alkaline and therefore help to keep the renal tubules permeable. The salts most frequently used are the citrate, acetate, and bitartrate of potassium. An ounce a day, dissolved in water, is a common dose of either of them; often smaller amounts will accomplish the desired results. A physician should be guided by the reaction of the urine as to the dose which he will continue after the urine is once made alkaline. To maintain alkalinity the drugs should be given in divided doses once in two or three hours. Copious draughts of water should also be given to promote diuresis and to wash the tubules of their contents.

Mercurials are important remedies in these cases, for in small doses given for several days in succession they will increase diuresis and the elimination of nitrogenous matter, and will as an alterative promote a better flow of lymph, the absorption of interstitial exudates, and even of foreign matter in the convoluted tubules. They are especially indicated in catarrhal cases. Calomel is usually preferred

to other salts of mercury. A quarter of a grain or less should be given three or four times in twenty-four hours for as many days.

It is quite as essential that the quality of the urine should be improved as that it should be increased in quantity. When the urine is greatly lessened in amount and uræmia is present or imminent, to increase its quantity is most urgent, and for the time its quality may be neglected. To improve its quality is a prominent object of treatment in subacute and convalescing cases. Alkaline diuretics are chiefly relied upon to increase elimination of nitrogenous matter, but lithium benzoate and similar drugs may be employed. Albuminuria and hæmaturia modify the quality of the urine. Their treatment has already been described.

The treatment which is essential for uræmia and the renal congestion will help to eliminate dropsies. When there is anasarca only, and especially when it is moderate in amount, catharsis helped by diaphoresis and increased diuresis constitutes an efficacious treatment. Salines are often given daily to hold œdema in check or help to eliminate it. They can accomplish this best if given to an empty stomach in concentrated solution. No fluid should be taken until they have produced copious watery movements. A large amount of fluid may be withdrawn from dropsical tissues in this way. But if copious draughts of water are taken with or immediately after the saline purgative, the latter only hastens its absorption from the stomach and influences the dropsy little or none.

To promote diaphoresis hot tub-baths may be used in mild cases and hot-air baths for those unable to be moved from bed. Often a hot pack will provoke free sweating and with much less discomfort or exhaustion than a hot tub- or hot-air bath. By a hot pack is meant enveloping a person in a sheet dipped in water as hot as can be tolerated, immediately after which he is covered heavily with blankets. When anasarca is very great and does not lessen under the treatment just outlined, puncture of the œdematous tissue will give relief. This is accomplished by introducing in many places in the lowest portions of the œdematous tissues minute cannulæ. It, however, seems preferable to me to make a single incision over the malleolus of each ankle, an inch long and almost deep enough to touch the bone. If after this a rubber sheet is so placed under the patient's legs as to conduct the water away, and if the head of the bed is raised so that the fluid will gravitate to the feet, all the subcutaneous tissues can be emptied in a few hours. This method is especially adapted to those who are strong enough to sit up.

In acute nephritis vomiting is often persistent and frequent at the outset. It makes the administration of drugs and of water almost an impossibility. It is best relieved by lessening renal congestion and

preventing uræmia. Cups, leeches, fomentations to the back, sulphate of magnesia hypodermically, or two or three drops of croton oil diluted with sweet oil upon the tongue or *per rectum* to deplete the kidneys, will lessen the irritability of the stomach more than antiemetics. What has already been said of the treatment of vomiting in uræmia is applicable here.

Fever which occurs in acute nephritis caused by cold or poisons absorbed from the alimentary tract, does not require special treatment. Chemical antipyretics are uniformly contraindicated. They increase the disorganization of the blood, many of them are renal irritants, and not infrequently when the kidneys are acting imperfectly therapeutic doses of them produce unfavorable effects—even fatal collapse. When nephritis threatens or arises in the course of infectious febrile diseases the bath-treatment which must be relied on for their relief can be continued. This and a proper diet are the best measures for the prevention of nephritis. Cold baths do not aggravate it when it is established.

During convalescence the greatest care must be taken to prevent relapses. Changes in the temperature of the room, clothing, and diet must be effected gradually and slowly. Exercise can be prescribed only with caution. The urine should be constantly watched as these changes are made. If the changes increase albuminuria or diminish the excretion of urine or cause albuminuria or œdema to return, they must be stopped or made more slowly.

Acute nephritis, if at all severe, produces marked anæmia which requires treatment during convalescence. Iron and bitter tonics, such as quinine and strychnine, will be found beneficial. So soon as the patient is well enough to take advantage of it an out-door life in a warm genial climate will complete the cure and stimulate repair better than medicines. This often necessitates a change of climate. It can be avoided, but is desirable if it can be afforded.

Something must be said of the prevention of acute nephritis. In the treatment of those infections which are often complicated, or followed by, nephritis, such as scarlet fever and diphtheria, a milk diet or when it cannot be taken a suitable substitute for it, with cleanliness of the alimentary canal and skin, and an abundance of pure genial air to breathe, are the most efficient preventives. Much of what has already been said of the prevention of uræmia might be repeated here. Abuse of alcoholics, gourmandizing, exposure to cold and dampness, are at times avoidable exciting causes of acute nephritis.

Chronic parenchymatous nephritis or chronic diffuse nephritis can be regarded as a degenerative renal lesion rather than as an inflammatory one. It is true that it often begins as an acute catarrhal inflammation, but when it becomes chronic, fatty degeneration of

renal epithelium is its most characteristic lesion. It is also true that the interstitial tissues are somewhat thickened and the glomeruli are modified in structure, but the gross as well as the most striking microscopical appearances are produced by fatty changes in the renal epithelium. The tubules are obstructed with cast-off cells, cellular débris and casts. Many of the glomeruli are made functionless by thickening of their capsules and by hyaline changes in them and the capillaries. The interstitial tissues are slightly increased in amount and apparently thickened by distention of their lymph-spaces with fat absorbed from the convoluted tubules and often by serous exudates. The functional incapacity of the kidney is the same as in acute catarrhal nephritis. The same indications for treatment exist, plus such treatment as the degenerative changes and chronicity of the lesions may demand. In rare instances the disease persists for many years. Interstitial hyperplasia may then predominate, the kidney contracting and all the phenomena of interstitial nephritis developing as a sequel to chronic diffuse nephritis. Chronic nephritis is liable to acute exacerbations, which for the time resemble symptomatically acute nephritis. A few cases are denominated chronic hæmorrhagic nephritis, because of profuse, persistent, or recurring hæmorrhages.

A diminished excretion of urine and urinary solids, and a tendency to fatty degeneration of epithelium demand correction. Uræmia is common. It is, however, usually chronic in form. Acute uræmia is much less common in this than in any other form of nephritis. If it does occur it is generally when there is an acute exacerbation of the disease, or when the stage of contraction is reached. Œdema is, with rare exceptions, an early and marked symptom. When it has once appeared it seldom wholly disappears, or if it does it reappears soon. It is, however, subject to great variation from time to time. Anæmia is also present, which with malnutrition produces an earthy, grayish color of the skin. In hæmorrhagic cases anæmia may be more profound and cause a clearer pallor. Digestive disorders may arise as complications, but are oftener due to mild uræmia. Strength and flesh are gradually lost.

It must not be forgotten that a group of cases of chronic albuminuria exists unaccompanied by loss of strength, anæmia, uræmia, or diminished excretion of urine, in which there is sometimes a large, sometimes a small percentage of albumin voided. The urinary sediment is very small in amount, contains few or no cells, no renal epithelium, a few hyaline and finely granular casts. As a rule these patients feel well and may continue so during a long lifetime. They often finally succumb to an intercurrent disease. While such persons must be looked upon as suffering from the most benign of chronic renal

maladies, that they have diseased kidneys and are prone to develop more serious trouble in them must be recognized.

Apoplexy, hemiplegia, and retinitis are not common complications of chronic diffuse nephritis. The dangers which must be averted are acute exacerbations, uræmia, œdema, or inflammation of serous sacs or of the lungs or heart. The prophylactic measures applicable to acute nephritis are equally applicable to acute exacerbations of chronic nephritis, and have already been described; so, also, has the prophylaxis of uræmia. Measures which lessen œdema or hold it in check are the only ones which will lessen a tendency to dropsy of serous sacs. Protection from cold and dampness by warm clothing and dry dwellings, or better still by a residence in warm equable climates, is most certain to prevent inflammatory complications such as endocarditis, pericarditis, or pleurisy. Those who suffer from chronic nephritis should make a permanent, or at least a winter, residence, if they can afford it, in a genial, equable, and dry climate, such as exists in western Texas, Arizona, or southern California. The dryness of these regions increases the elimination of fluid by the lungs and skin and thus helps to diminish œdema. If there is no œdema a warm winter climate will be sufficient, such as can be found in most of our Southern States. If there is much œdema a climatic change is not indicated; for a patient is then too feeble to take long journeys, and the comforts of home are essential to his well-being.

The treatment already described for acute nephritis is applicable to chronic diffuse inflammation of the kidneys so far as drugs are required to promote diuresis. If, as happens now and again during periods of remission in the disease, the urine becomes normal in amount, normal in specific gravity, and œdema disappears, diuretics should of course be discontinued. Treatment of albuminuria can then be tried. The hæmaturia of hæmorrhagic cases must be overcome by the remedial agents described above. Œdema is more persistent than in acute cases, and treatment seems less efficacious. For its relief, as in acute nephritis, diuretics, cathartics, and diaphoretics must be used. Ankle-incisions must oftener be resorted to. By these, if the œdema has not been of too long standing, perfect drainage will be effected, but if the œdema has been very chronic the subcutaneous and interstitial tissues will have become thickened by cell-proliferation and the lymph-spaces will thereby be partly occluded; the normal free and almost universal anastomosis of lymph-spaces will be destroyed. For this reason, also, the making of ankle-incisions repeatedly will form a less and less efficient mode of draining the tissues as time passes. Drainage can be made more perfect in such cases if before the incisions are made vigorous massage is practised. It should be practised so long as the incisions are open and serum flows from them. I have

seen great relief afforded by the repetition of incisions three and four times, at intervals of a month or two. It is rare, however, that they prove very effective after the second time.

Considerable dropsy of the pericardial sac demands the removal of the fluid by aspiration. Pleural dropsy rarely endangers life. At times it may form a serious lesion and will require aspiration. Before these forms of dropsy develop the more usual treatment for œdema has generally been thoroughly tried and failed. Aspiration then becomes a necessity so soon as enough fluid accumulates in the pericardium or pleuræ to endanger life.

In even mild cases warm baths should be taken frequently to increase the activity of the cutaneous glands. They should be taken every fourth or fifth day. If uræmia exists, the hot bath or pack may be used daily. Serous, cardiac, and pulmonary inflammations require the treatment appropriate to them under other conditions. When they complicate nephritis they make the prognosis especially grave.

Fatty degeneration has been described as the characteristic lesion of this malady. It is best combated therapeutically by those measures which improve nutrition. It is in this class of cases that iron is of especial service. It must often be given for months at a time. The best results are obtained by a change of preparations from time to time, and by the use of those only that are least irritating to the stomach. My own preference has been for the citrate and potassio-tartrate of iron, ferratin, and desiccated blood. Moderate doses will give as good results as very large ones. Of medicinal agents iron may be regarded as the one constantly applicable. Oxygen is given by inhalation with the hope that it will promote more perfect metabolism. It is well known that no more oxygen can be taken by blood-corpuscles from pure oxygen gas than from air. How, therefore, can it do good in nephritis? Clinical experience has seemed to me to demonstrate its inutility unless there is obstruction to respiration by bronchitis, asthma, œdema of the lungs, or similar affections. Whenever aëration of the blood must be effected in an unusually small area of lung-tissue oxygen is of great value. Although oxygen is of little use, fresh air—if possible, out-door air—sunshine, and cheerful surroundings are of great value, as they stimulate better nutrition. Although in acute nephritis a patient is best kept in bed so long as there is œdema, the same rule cannot be enforced in chronic cases. If œdema is not considerable, gentle exercise, not too long continued, is wholesome. When œdema interferes with walking or is much increased by even short walks, massage may be substituted for active exercise. Massage should be practised with care that the patient may not be made too weary and tissue-waste unduly augmented.

An abundance of pure water should be constantly taken as a

diuretic. Many patients are benefited by a visit, for one or two months annually, to springs like those at Waukesha in Wisconsin. The change of scene, of food, of air, of life, stimulates the patient, encourages hopefulness, and improves nutrition. At such places hot baths are taken often and with regularity. Several quarts of water are usually drunk daily, for at a spring a patient will drink freely of a water which they will only use sparingly at home. The example of many drinking at the spring inspires each one to imbibe freely. Springs must be chosen which are in pleasant country towns, where appropriate foods can be readily obtained, and where the waters are peculiarly free from both inorganic and organic matters.

During periods of acute exacerbation a milk diet should be maintained if possible. At other times a diet of non-nitrogenous food with milk as a staple should be prescribed. Amylaceous foods and fruits are the best. If the kidneys eliminate a normal amount of nitrogenous matter and water, and if œdema is gone or trifling, a little of those albuminous foods already described as least harmful in albuminuria may be permitted. Their effect upon the quantity of albumin in the urine should be constantly watched. If they increase it, they must be interdicted.

Mercurials are useful in this form of nephritis for the reasons already assigned for their employment in the acute form of the disease. They are usefully employed intermittently, for perhaps a week at a time.

Even if cathartics are not indicated by lessened urination or œdema, they should be given often enough to prevent the accumulation of much fæcal matter or the products of intestinal fermentation.

If the renal lesion is being transformed into a cirrhotic one, mercurials are supposed to be indicated because they often modify plastic inflammation, help to bring about a resolution, and prevent interstitial hyperplasia. Undoubtedly in all stages of the disease the tendency of the drug to stimulate the flow of lymph helps to free the interstitial tissues of the kidney of detritus of disorganized cells absorbed from the tubules. The removal of this with greater rapidity will lessen the tendency to hyperplasia about the lymph-spaces and blood-vessels. The iodides have sometimes been used in the same cases and for the same purposes, but they can rarely be used efficiently, for they disturb digestion.

The heart may undergo hypertrophy even in the early stage of this malady, but usually such changes only occur after the kidney becomes cirrhotic. The heart grows feeble in proportion as nutrition is impaired and general strength is lost. Cardiac weakness is often increased and sometimes precipitated by endocarditis or pericarditis. A rapid, feeble action of the heart is common in all severe cases and

increases dropsy. Cardiac tonics are then demanded. The best are digitalis and strophanthus.

Amyloid infiltration of the kidneys and chronic diffuse nephritis are commonly associated in varying proportions. The lesion of amyloid infiltration and its location is so well known that it requires no description. Unfortunately we do not know its exact mode of production. No known treatment will produce resolution in the tissues in which amyloid deposits have taken place. Treatment must therefore be directed rather to the coincident parenchymatous changes, and does not differ from that of chronic diffuse nephritis. In rare instances recovery has taken place when the lesion was not of long standing, or improvement has occurred in more prolonged cases by removal of the conditions under which amyloid infiltration takes place. When, as oftenest is the case, chronic suppuration is its cause, complete drainage of the abscesses may check the amyloid disease. So surgical treatment of chronic destructive osteitis or periostitis may check or bring about spontaneous recovery from amyloid disease. It is common in cachexia from tuberculosis, syphilis, and leukæmia. Treatment of these diseases may check its progress, and in the case of syphilis rarely effect a cure. Usually these diseases are incurably fastened upon a patient before amyloid infiltration occurs.

Interstitial nephritis, or renal sclerosis or atrophy, is the most chronic of all the renal affections. It is impossible to fix its exact time of onset, so insidious is its beginning and development. It may exist for five or twenty-five years. The first is probably the commonest length of its course.

It is characterized by a destruction of glomeruli and renal epithelium, morsel by morsel. Except where minute particles are destroyed the renal tissue is sound. The glomeruli involved atrophy, the tuft of capillaries shrivels or disappears, the capsule thickens and contracts. The epithelium of the tubules grows small, disintegrates, disappears, and the tubule is obliterated by hyperplasia of connective tissue which takes place as atrophy advances in the tissues functionally important to the organ. Endarteritis and often obliterating endarteritis occurs in the affected regions. Although the lesions spread very slowly they finally destroy much of the secreting power of the kidneys. As in other than the affected parts of the organs glomeruli and renal tubules are normal, less change is wrought in the character of the urine than in the other varieties of Bright's disease. And as the kidneys atrophy gradually, during many months and often many years, the individual will as gradually lose flesh and, less perceptibly but quite as surely, strength. Loss of flesh is generally not considerable. It is so slow that it is rarely looked upon as pathological. Digestive disorders, headache, or uræmic symptoms usually first

call for treatment. The existence of the disease is not unfrequently overlooked until acute uræmia demonstrates it and causes sudden death.

Atheroma or general endarteritis is associated with renal atrophy in many cases, and is often the cause of the renal changes. In minute areas, because of the imperfect supply of blood through the narrowed arterioles, atrophy occurs, and connective tissue hyperplasia, which is the correlative of atrophy of highly differentiated structures, develops. But all cases are not the result of arterio-sclerosis. In some instances destruction of renal tissue morsel by morsel is probably effected by chemical irritants or poisons ingested, made in the intestinal tract or tissues, which act intermittently rather than constantly. When renal atrophy has occurred the heart must hypertrophy and blood-tension must be raised to make that portion of the kidneys which is still active capable of eliminating a normal amount of waste. High arterial tension and cardiac hypertrophy are quite as much a part of the disease as renal atrophy. If there is generalized endarteritis it also will lead to enlargement of the heart and arterial rigidity. Occasionally the lesions of chronic diffuse nephritis precede and rarely are superimposed upon those of the chronic interstitial form.

The physiological results of this renal atrophy are elimination of urine in increased amounts. This is due to high arterial pressure and a healthy condition of numerous glomeruli. Those Malpighian bodies which are destroyed are impermeable; those in the process of destruction, which are few at any one time, produce the minute amount of albumin that is found in the urine. As the destruction of renal tissue often goes on intermittently, albumin is many times a variable ingredient in the urine. In the early stages when disease involves only a very few tubules and only minute areas in any one, casts and cells may not be discoverable in the urinary sediment. Later in the course of the malady, and especially if its slow course is slightly quickened, a few hyaline or finely granular casts will be discoverable. Renal epithelium and blood-corpuscles are almost constantly absent. Casts and cells are more abundant in the third stage of the disease when the heart is dilated and weak, and when the balance between arterial and venous circulation is destroyed. Although the quantity of urine is greater than normal so long as the heart is strong, the quantity of nitrogenous matter eliminated is only normal or less; therefore the urine has a low specific gravity. It is lowest when the kidneys are much atrophied and the heart is still strong. Its percentage may increase and the quantity of urine may diminish when the heart flags, but even then the quantity voided in twenty-four hours is often subnormal. The great danger of uræmia is evident. This danger is increased by coincident indigestion, intestinal fermentation, sluggish

action of the liver, and therefore imperfect metabolism. Uræmic coma is commoner in this form of Bright's disease than convulsions. Acute uræmia, even fatal, often occurs without premonition and unexpectedly; chronic uræmia is also common. Pressure suddenly increased within arteries that are atheromatous frequently causes their rupture; cerebral apoplexy is therefore a not uncommon complication of interstitial nephritis. It is the immediate cause of death in many cases. Hæmorrhages may occur into the retina and produce blindness or blurred vision, or it may be into other tissues. Whenever extra work is continuously demanded of the heart it hypertrophies, providing it is well-nourished; it cannot, however, by hypertrophy keep pace indefinitely with the increasing demands for work, therefore if a patient is not killed by uræmia, apoplexy, or some intercurrent trouble, the natural termination of the malady is cardiac weakness, dilatation, and all the changes characteristic of asystole.

The most important indications for treatment of renal atrophy are (1) if possible to remove the cause of it, that the disease may be stopped in its progress; or, if that is impossible, (2) to avert the commonest fatal complications, such as uræmia, apoplexy, and cardiac exhaustion, that the course of the disease may be prolonged. These complications are least liable to occur in the earliest stages of the malady; it is therefore important to recognize interstitial nephritis in its incipiency and to meet the indications early.

The disease is eminently one of mature life, death from it occurring almost exclusively between the fortieth and seventieth, and oftenest between the fiftieth and sixtieth years. It is between thirty-five and fifty that its beginning must be sought in those who by disposition, disease, or mode of life are liable to it. So often does it complicate the uric acid diathesis that atrophied kidney is frequently spoken of as gouty kidney, especially in those countries where gout is common. It is therefore important in a very large number of cases to employ as prophylactic measures those that must be used for gout. The diet should be simple, rather abstemious; especially should large quantities of meat be proscribed, and highly spiced or seasoned food. Alcoholics should not be used. Pure water should be drunk freely. If possible an out-door life should be led and exercise enough taken to maintain active and complete tissue-change. Indigestible foods must be avoided. Digestive disorders must be promptly corrected. Whether it is uric acid or some other less well known ingredient of the blood that provokes renal atrophy we do not know. If it is not uric acid, it is something which increases in the blood simultaneously with it. Chronic lead-poisoning can produce the same lesions as gout, and can, indeed, provoke the latter. Lead salts should not be employed as medicine in this disease, and accidental lead-poisoning

should be prevented. Syphilis undoubtedly produces a few cases of renal atrophy. Sometimes its specific treatment will check the progress of the disease or even prove curative. Chronic malaria is a much less common although undoubted cause of it. Quinine may have quite as curative an effect in such cases as mercurials in syphilitic ones. We know of no way to combat with certainty atheroma, which is so common a cause of chronic interstitial nephritis. Good hygiene, freedom from mental and physical over-exertion, and life in a bland, genial climate will most surely prolong life in such cases.

Uræmia in interstitial nephritis is the result sometimes of such destruction of renal tissues that normal elimination can no longer be maintained. Much oftener it is due to partial renal incompetence and to accumulation in the blood of products of intestinal fermentation and of imperfect metabolism. The treatment of uræmia has already been described. It is important in these very chronic cases to instruct patients to watch carefully the quantity of urine voided. This can only be done by measuring all that is eliminated in twenty-four hours. Such measurements of the urine should be made once in seven to ten days during the earlier part of the disease's course and oftener in the later part. After a few measurements and simultaneous analyses the quantity that must be secreted by the individual, in order that a normal elimination may take place, can be ascertained. Whenever he finds that he is making less, he should be instructed to call upon his physician for a modification of diet, or diuretics may be needed. It is well to inform him what are the common symptoms of mild uræmia that he may place himself under treatment so soon as they arise. The need of clean intestines and freedom from indigestion should especially be explained. When uræmia threatens, a strict diet, such as has been described, must be employed, but during most of the long course of this disease the diet can be varied almost as it would be in health. A patient should eat less, especially less of meats and of rich and highly spiced or dressed foods. Those articles that are most inclined to ferment in the alimentary tract should be avoided. Alcoholics should be interdicted. Water must be taken freely. Exhalation from the skin should be promoted by warm baths and friction.

The second group of dangers—cerebral hæmorrhage and cardiac exhaustion—arise from high arterial tension. If arteries are atheromatous it is especially necessary to lessen arterial tension and to prevent a sudden increase of it. Digestive disorders and constipation are the commonest causes of high tension. The frequent—or, if necessary, the constant—use of laxatives will empty the intestines and lower arterial pressure. Food and medicine must be adjusted to prevent slow digestion and fermentation within the stomach. Over-

exertion, either mental or physical, will increase arterial tension, and must be avoided. While prolonged and violent exercise is interdicted, gentle exercise is a necessity to maintain good lymph-circulation and good metabolism.

To suddenly chill the surface of the body will disturb nutrition, temporarily increase arterial tension, and will often excite in the nephritic, who is particularly liable to inflammation of the organs of respiration, dangerous bronchitis, pleurisy, or pneumonia. Careful protection of the skin by woollen garments is therefore necessary. If possible, these patients should not live in damp, changeable climates, at least not during the inclement seasons.

Nitrites can be employed from time to time with advantage to lower blood-pressure. Nitro-glycerin and sodium nitrite are the preparations to be preferred. They are often prescribed for weeks at a time. Some individuals cannot use them, for they are apt to produce uncomfortable headache when employed in full doses. The tinctures of veratrum or aconite with sweet spirits of nitre may be prescribed in their place. The iodide of potassium also lessens arterial tension and can be used for long periods of time more comfortably than the nitrites. It does not relax the arterioles to the same extent, but produces a more prolonged effect, and therefore does not need so frequent repetition. It too cannot be used by certain individuals because of their susceptibility to iodism, or because it disturbs their digestion. When the heart is hypertrophied and arterial tension is high, digitalis, strophanthus, their congeners, ergot and strychnine, are contraindicated.

In the last stage of the disease, when the heart grows weak, the kidneys act less freely, and œdema develops, the danger of uræmia increases and must be averted with redoubled care. The pulse grows small, is softer and quicker. Strophanthus can now be used advantageously to temporarily strengthen the heart and increase diuresis. Even digitalis can be employed with safety. Iron and bitter tonics are useful to stimulate nutrition. Rest and a milk diet, or at least a non-albuminous one, are a necessity. Alkaline diuretics, cathartics, and diaphoretics must be used often or constantly to avert uræmia and to hold in check or to lessen œdema.

Such drugs as the iodides, mercurials, and double chloride of gold and sodium have not infrequently been employed in renal atrophy, hoping thereby to lessen the formation of new connective tissue. I believe the latter of them has been generally discarded as useless. I have obtained no perceptible results from it. The good effect of the iodide of potassium must be assigned to its influence upon blood-pressure rather than to its alterative properties. The mercurials do good as intestinal antiseptics and diuretics. Moreover, the renal

atrophy is not to-day thought to result from connective-tissue hyperplasia. The latter fills a gap caused by atrophy and disappearance of normal tissue. It is a general law of pathology that such hyperplasia occurs whenever neighboring highly differentiated structures are destroyed. There is therefore no reason why the increase of renal connective tissue should be combated. It is destruction of tissue peculiar to the kidney that must be prevented.

Disturbances of digestion govern the diet oftentimes in these cases. An acute exacerbation and consequent diminution of urine and uræmic symptoms are indications for a milk diet. Under other than these circumstances the diet can be varied and mixed. Food should be eaten abstemiously. Care should be taken not to overtax the digestive organs or permit accumulation of food or its detritus in them. An abstemious diet is not one naturally preferred by these patients. They must be taught to use it. As a rule, they drink only small quantities of fluids, and for the most part objectionable ones. They must also be taught to drink water or milk copiously. Meats especially should be used sparingly. Their relative toxicity has already been dwelt upon, and need not be repeated. If digestion will permit fats, cream, butter, and farinaceous foods should be eaten freely. While water is the best beverage, tea and coffee need not be wholly forbidden unless their use, as is often the case, leads the invalid to drink too little of fluids.

PYELITIS.

Pyelitis may be acute or chronic, and treatment must be adapted to each state.

Acute pyelitis is commonly due to stone in the kidney's pelvis. It may be caused by toxic agents which are eliminated by the kidneys during fevers. As a rule, this latter form is a mild affection which disappears spontaneously when fever subsides. Acute inflammation of the renal pelvis may also develop by extension of blennorrhœa or other suppurative disease from the lower urinary organs. It is evident that prophylactic measures can be successfully instituted against only a part of these causes. If a stone exists and is a constant source of irritation, it must be removed to effect a cure. Pyelitis which accompanies fevers can be prevented or lessened in intensity by a milk diet, copious draughts of water, and hydropathic treatment, for by these means the urine will be diluted and become less irritating. Whenever the urinary channels are infected, especially when the bladder is, as speedy a cure as possible must be effected to prevent

the development of pyelitis by extension of infection. In such cases the bladder must be emptied frequently and perfectly. For if urine is long retained and the bladder is distended, the chances of extension of disease to the kidney are greatly increased.

When acute pyelitis is detected, local depletion will often give much relief to the pain in the back which the patient usually feels, and will shorten the course of the inflammation. It is best effected by leeches or cups over the kidneys. In mild cases counter-irritants can be substituted for these measures. Fomentations applied to the back after local bleeding or counter-irritation will prolong their good effects. Depletion can also be accomplished by catharsis. Drastic or calomel purges are to be preferred to salts. The latter are in part eliminated by the kidneys and are slightly irritating to the pelvis and bladder. Not only do these remedies deplete but they also remove from the intestinal canal materials which would otherwise be absorbed, eliminated through the kidneys, and prove irritating to them.

It is also necessary to make the urine thin and bland, that it may be as little irritating as possible to the mucous membrane of the pelvis of the kidneys. This is best accomplished by encouraging copious libations of water and by a milk, or at least a liquid, diet.

In the more severe cases pain in the loins is hard and requires relief. Generally local depletion and fomentations will mitigate or remove it. The latter can be made more anodyne by adding to them opium or belladonna, or both. The tinctures of these drugs can be mixed in a poultice, or belladonna-leaves can be added to the flaxseed which is used in its composition. If pain cannot be relieved by these measures, morphine or codeine must be given by the mouth in sufficient doses to accomplish this.

Antiseptics have been administered *per os*, with the hope that they would lessen or prevent suppurative pyelitis. They have proved of little use, and by many are no longer employed. Those that have been most used are salol, naphthol, and resorcin. All the antiseptics that have been tried are more or less irritating to the kidneys, and must be used with caution when there is acute renal inflammation. Saccharin will prevent fermentation in urine, and when administered by the mouth will make it strongly acid. Both of these properties make it, theoretically, of probable utility; moreover, it can be given in large doses without harm. A few clinicians have reported favorable results from its employment in pyelitis. I have not tried it in acute cases; in chronic cases it will render the urine acid. Its antiseptic power is easily demonstrable in the laboratory, but not so easily at the bedside.

Chronic pyelitis usually follows acute attacks, and arises from the same causes, but it may result from obstructions of the ureters or

urethra. The latter may be due to stone or other foreign body in the ureter, or to compression by tumors, cicatricial tissue, or thickening of the walls of the urinary channels. Inflammation may extend from areas of chronic inflammation in the bladder, urethra, or renal parenchyma. Chronic pyelitis is liable to acute exacerbations. These must be guarded against by warm clothing, and, if possible, a life in an equable climate. The ingestion of renal irritants, or their absorption from the intestinal tract, must be guarded against. Excess of physical exertion should be avoided, especially if pyelitis is due to calculus. It goes without saying, that whenever possible the cause of the malady must be removed. This can sometimes be accomplished by surgical procedures, very rarely by medical ones.

As in acute cases, food must be bland. During periods of acute exacerbation it should be liquid only; at other times it may be varied. It may be like that eaten in health, but articles which contain oxalates and other renal irritants must be avoided. Care should be exercised to limit gastric and intestinal fermentation, and regular, copious bowel-movements should be maintained. The creation and absorption of renal irritants can thus be lessened. Water should be taken copiously to make the urine bland, to flush the kidney and to help keep the pelvis clean. Two quarts of pure water ought to be taken daily. What has already been said of the use of water in lithiasis is applicable to cases of pyelitis calculosa. If chronic pyelitis is characterized, as it so often is, by slight suppuration, sulphur-waters can be used advantageously, as they lessen and prevent suppuration.

Balsamic preparations are employed in these cases, chiefly to prevent or to lessen suppuration because of their antiseptic properties. They are applicable when the parenchyma of the kidney is not involved, for they tend to congest, and in large doses to inflame it. Benzoic acid and the benzoates are among the best of these. Benzoic acid is soothing to inflamed mucous membranes. It makes the urine acid, and is mildly antiseptic. It can be given as benzoic acid or as a benzoate of sodium or lithium or as an emulsion of gum benzoin. The oil of sandalwood is well tolerated by many individuals; and it, too, lessens suppuration in the urinary channels. Copaiba and cubebs are too apt to disturb the stomach, if used in efficient doses, to be very useful in chronic pyelitis. Often infusion of buchu is prescribed. Nuclein has been much experimented with during the last two years, because of its possible power of combating deep-seated suppuration by its antiseptic property and ability to provoke leucocytosis. There are few reports in our current literature of its trial in pyelitis. I have employed it in several cases without positive results. One of these cases was due to cystitis which was provoked by retention of urine because of paralysis. At the time the patient came under treatment

the pelvis of the right kidney was greatly distended with pus. Prompt and very great improvement was effected, indeed almost a cure, by the use of nuclein and by frequently emptying the bladder through a catheter. This latter procedure drained the distended kidney. At the same time the cystitis was treated by washing the bladder with mild antiseptics. I have seen just as good results obtained from the latter procedures only, and do not feel that the good effect observed can with certainty be ascribed to nuclein. I had at the same time another patient under treatment whose pyelitis was due to renal tuberculosis: although nuclein was employed most patiently I could detect no good results. In the mildest cases in which I have employed it positive results have also been wanting.

Astringents are used to lessen the formation of inflammatory exudates, both mucus and pus. In mild cases, especially those characterized by mucous rather than by purulent exudates they are sometimes useful. Many times they are employed in alternation with balsamic preparations. One is used for a week or two, and then the other.

In both acute and chronic cases complicated by hæmorrhage, the treatment described above for hæmaturia must be used.

Kelly of Johns Hopkins Hospital has succeeded in not only removing from the pelvis of a kidney considerable amounts of sand and small gravel by catheterizing the ureter, but has succeeded in cleansing it with antiseptic washes. Such treatment has in his hands proved as efficacious as washing the bladder does in cystitis. Unfortunately it is a difficult procedure. It, however, creates hope of success in many cases that would be hopeless with other medical treatment.

In all acute cases and acute exacerbations in the course of chronic ones, rest in bed should be enjoined. In mild chronic cases gentle exercise may be permitted and is even useful, for it helps to maintain better general health, but great or prolonged exertion should be avoided.

If suppuration is considerable and successful drainage cannot be maintained through the ureter, a surgical operation is necessary in order to establish it.

(See also the latter part of Dr. Belfield's article.)

HEADACHES AND NEURALGIA.

By WHARTON SINKLER, M. D.

Headache is common in all disordered conditions of the system, whether acute or chronic. It may be a symptom of brain disease or a forerunner of fevers. It is frequent in diseases of the digestive organs, and it often occurs in kidney disease. In fact, it may happen in the progress of almost all acute or chronic diseases at some time in their course, or may precede them. Many theories have been suggested as to the nature of the pain in headache—the structure in which it is situated, whether external to the skull or internal, whether due to vascular changes or to disturbances in the nerves themselves. The inability of patients to locate the seat of pain when suffering from an attack of headache shows the difficulty of determining the tissues involved.

In organic headaches—as, for example, those from tumor—the pain does not always correspond to the location of the growth. A tumor in the occipital region may cause persistent frontal pain. The truth seems to be that there are many different forms of headache in which the pain is situated in different structures.

In rheumatic headache the pain is external, and is probably seated in the muscular portion of the occipito-frontalis and in the fibrous tissues of the scalp. In the headache of meningitis we have an example of pain in a structure within the cranium.

Niemeyer was of the opinion that in most headaches the pain was in those branches of the fifth nerve which are distributed to the dura. Hamilton,[1] however, is of the opinion that generally headaches are due to over-distension of the blood-vessels distributed to the brain. While it is no doubt true that there is undue fulness of the cerebral vessels in headache, there is something more than the pressure of blood which causes the pain. Whenever the head is held down there is engorgement of all the vessels of the scalp and brain, but this does not cause pain under ordinary conditions.

I recently examined a man in whom the skull had been trephined three years ago for the removal of a tumor as large as a hen's egg. There is now an opening in the skull about three inches by two and a

[1] *Modern Treatment of Headaches.*

half inches, and the brain is covered by the dura only. When the patient holds his head down the vessels in the dura can be seen to become swollen, enlarged, and pulsating, but he does not have pain. The patient also suffers from attacks of headache which are quite severe and frequently last for a day; so that in this case the large trephine opening in the skull, which is certainly sufficient to prevent any undue blood-pressure, does not obviate the pain of the headache.

For the production of pain there must be a hyperæsthetic condition of the nerves, either the sympathetic nerve-filaments or the branches of the fifth which are distributed to the dura; and it is then that the pressure of the blood against these may cause pain.

It is doubtful if the fact of the brain being in an unyielding case has anything to do with the degree of pain felt. We know that large tumors of the brain may gradually grow without being accompanied by pain, and in cases in which there has been an artificial opening made in the skull the patient may continue to have the same kind of headache as before, as in the case referred to above. The dura mater, as already mentioned, receives branches from the fifth nerve, and is the only intracranial structure which is supplied by a sensory nerve. Fibres of the sympathetic have been traced into the pia, and the blood-vessels throughout the brain are accompanied by branches of the sympathetic.

Gowers[1] remarks: "The cerebral substance seems, under normal conditions, to be destitute of sensibility, but from this fact the assumption has been perhaps too hastily made that it cannot be the seat of pain when disordered. It should be remembered that the normal sensibility of the peritoneum would not prepare us for the intense pain of peritonitis." We should remember that all pain must be received by the individual through the activity of certain nerve-cells in the cerebral centres. In neuralgia of the extremities those cortical cells are concerned which receive impressions by the fibres through which sensory impulses pass from the periphery.

The same relations exist in the head. The nerves which are irritated convey the impression to those cells in the cortex which are connected with the afferent nerve-fibres from the membranes. We do not know whether there is the same connection between the cells in the cortex of the brain.

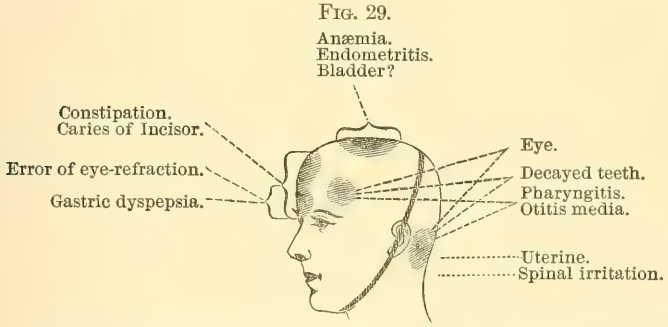
Gowers[2] says: "Sympathetic nerve-fibres accompany the arteries of the cerebral substance, and there is reason to believe that the functional state of the cortex influences the state of the arteries, as is the case in all other organs, and there must be a relation of the cells of the cortex to the vaso-motor centre. Now, it is quite possible that

[1] *Diseases of the Nervous System*, p. 529. [2] *Op. cit.*, p. 1190.

there may be a sensory representation of the cortex in the cortex itself, but of this we cannot feel so confident as of a sensory representation of the membranes in the cortex."

A good deal of stress has been laid on the location of the pain in headache as indicating disease in different organs. Vertex pain was formerly considered to point to uterine disease; now the occipital region is considered the seat of pain due to womb disorders. The accompanying diagram from Lauder Brunton indicates the region to which pain due to disease of remote organs is generally referred:

FIG. 29.



Chronic Headaches of Functional Origin (*Medical News*, March 16, 1889).

It will be convenient, in considering the subject of headaches and their treatment, to divide them into certain varieties. This course has been pursued by all writers on the subject, but I do not think the extensive subdivisions which have been made are desirable, and I will adopt a simpler classification.

Headaches may depend upon causes within the brain and upon those external to it.

(*a*) *Headaches from Diseases exterior to the Brain:*

1. Rheumatic headache.
2. Headache from diseases of the skull and periosteum.
3. Neuralgic headaches.

(*b*) *Headaches due to Disorders within the Cranium:*

1. Anæmic headache.
2. Hyperæmic headache.
3. Hemicrania or migraine.
4. Neurasthenic headache.
5. Dyspeptic or bilious headache.
6. Toxic headaches, from lithæmia, uræmia, diabetes, poisons absorbed into the system, etc.
7. Organic headaches, from tumor, meningitis, etc.

8. Sympathetic or reflex headaches, from eye-strain, uterine or ovarian disease, etc.
9. Constant chronic headache.

(*c*) *Headaches of Children.*

Anæmic Headache.

Anæmic headaches are met with most frequently in women, but they also occur in men. The typical form is seen in women who are neurasthenic and bloodless. The pain is usually of a dull gnawing character; it is constant, and is most commonly situated in the vertex or forehead, but it may be over the entire head. The pain is usually relieved by the recumbent position, but this is not always the case. This is generally the form of headache which occurs in neurasthenic persons, and it may be induced or aggravated by excessive mental or bodily effort. Headaches of this form are constant, are not intermittent, and the chronic constant headache which is sometimes met with often belongs to this class. Sometimes the pain is felt only for a part of the day, in which case it is the latter part of the day, when the patient is tired, that the pain is most severe. The sufferer from this form of head-pain is depressed in spirits and despondent, is timid, and has a dread of things which it is improbable will occur. She suffers from tinnitus aurium, has attacks of dizziness, and often has flashings of light before the eyes. Sleeplessness is a common symptom, but the patient is often drowsy during the day. The digestive functions are disturbed, the tongue is heavily coated, the breath offensive, and there are the usual symptoms of gastric disorder.

Fothergill, describing these headaches,[1] says: "The pain varies in character from a dull weight to acute agony. It may be confined to the temples, the forehead, or the occiput, or it may be general. It may be accompanied by 'swimming' in the head or 'intolerance' of light or of sound. At times the slightest sound is simply unbearable. In other cases comparative ease can only be secured by lying in a dark room, like the Rev. Mr. Irwine's sister Anne in *Adam Bede:*

"'Miss Kate was sponging the aching head with fresh vinegar when he went into the room, so darkened by blinds and curtains that Miss Kate could not knit at the best.

"'It was a small face, that of the poor sufferer; perhaps it had once been pretty, but now it was worn and sallow. Miss Kate came toward her brother and whispered, "Don't speak to her, she can't be spoken to to-day." Anne's eyes were closed and her brow contracted as if from intense pain.'

"Miss Anne Irwine's headaches were those of indigestion evidently,

[1] *Indigestion and Biliousness*, p. 38.

and very bad headaches they were. They belonged to that variety which comes on the day after the meal which has provoked them, where there are some noxious products of late digestion poisoning the half-starved brain. In many cases the headache is distinctly that of anæmia, the blood being drawn to the abdominal visera by the digestive act. There is often a sensation of swimming in the head felt along with the pain, or dizziness. The pain in the vertex often experienced is symptomatic of cerebral anæmia."

The bowels are constipated and the colon is frequently loaded. The pupils are often dilated, but they may be normal in size, and the ophthalmoscope shows pallor of the optic disk and retina. The heart's action is frequent and the pulse feeble. Hæmic murmurs are often heard over the heart. During an exacerbation of pain the face may be flushed and hot with throbbing of the vessels, and this may give rise to the false impression that there is congestion of the head rather than anæmia. Tenderness over the vertebræ is often present, and there is associated with the headache neuralgia in the branches of the fifth nerve. The following is a good example of anæmic headache:

"K. H——, aged sixteen years. Catamenia began at the age of fourteen years. Patient has been regular, but there has been no excessive flow. Two months ago, shortly after returning to work in a milliner's, she became quite suddenly very anæmic. She lost her color, became weak, was short of breath on exertion, and suffered from palpitation of the heart. About the same time headaches began. The pain was always frontal, generally coming on in the afternoon. Lying down relieves the pain, but fast walking or going up stairs causes increase of the headache and throbbing all through the head from the forehead to the occiput. The menstruation is scant; the patient has nausea and poor appetite. Pulse 88, very small. Heart is feeble, but there is no murmur heard. The face is pallid and the conjunctivæ and mucous membranes of the lips seem to be without blood. Examination of the blood shows that the hæmoglobin is 30 per cent. and the blood-corpuscles 4,300,000."

These headaches may be the result of hæmorrhages, but they are more frequently due to slow deterioration in the quality of the blood or to some nervous causes which diminish the calibre of the blood-vessels and thus reduce the blood-supply to the brain.

Severe headache is often experienced by women when they first get up from childbed where they have flooded profusely. We must remember, however, that cases of extreme anæmia are frequently met with in which no headache is experienced at all, so that it seems necessary for the production of anæmic headaches that there shall be some disorder of the nervous elements as well as deficient supply of blood. A patient now under my care has been in a condition of extreme anæ-

mia varying in degree for several months. At one examination of the blood, made with great care by Dr. C. W. Burr, the hæmoglobin was 35 per cent. and the corpuscles but 2,240,000, which is about 45 per cent. of the normal number; and yet she has never had headache during her illness.

In this form of headache it is very common to see a craving for stimulants in the subjects of it, as a glass of wine or spirits often relieves the pain in the head temporarily. They are also liable to become addicted to opium and chloral, and I have seen several cases of morphine habit which began in the taking of small doses of morphine for the relief of anæmic headaches.

The prognosis is good if the system has not become reduced to too low a point, but recovery is often slow, and the headaches may persist for some time after the general condition of the patient has improved and is apparently normal.

Treatment.—The obvious course of treatment is first to improve the nutrition and build up the general health. We of course cannot hope to relieve the headaches until the causes of them have been removed; therefore, the first indication is to relieve all sources of the anæmia that can be reached, such as uterine hæmorrhages or bleeding hæmorrhoids and other discharges. Change of air and travel will often accomplish more than any therapeutic means that can be adopted. When we cannot send the patient away from home the rest treatment is exceedingly useful. The very best results can be obtained by building up the general health, enriching the blood, and improving the nutrition by the rest treatment.

Iron and arsenic are of more value than any other internal remedies which can be given. In selecting a form of iron we should use that which is most easily absorbed and least liable to constipate. Day is very partial to the ammonio-citrate of iron. The pill of the carbonate of iron—the so-called Blaud pill—is a very useful form when it is properly prepared. This is the pill which Niemeyer declared was the foundation of his success in practice, saying "my good fortune in the treatment of chlorosis—to which, by the way, I owe the rapid growth of my practice—having given me a great reputation as the possessor of a sovereign remedy against that disease." Niemeyer's formula is—

℞. Ferri sulph. pulv.,
Potass. carb. puræ, āā. ℥ss.
Tragacanth., q. s.—M.
Ft. pil. No. xcvj.
Sig. Three pills three times a day—four or five pills may be given three times a day.

Many of the Blaud's pills which are dispensed are of very little value, because they have undergone changes which make them quite different from the original preparation. It is better to prescribe freshly-made Blaud's pills in all cases where a good druggist is available. The lactate of iron is a favorite form with Weir Mitchell, and the metallic iron—iron by hydrogen—is probably as reliable a form as can be used. Large doses of the subcarbonate of iron are well borne, and usually show speedy benefit in the quality of the blood.

In some patients of feeble digestion I have found dialyzed iron very useful, and the elixir of malate of iron and the albuminate of iron are excellent forms where the digestive organs are delicate.

Arsenic is of prime importance in conjunction with iron in these cases. It should be given in small doses at first, and is best administered in the form of Fowler's solution. In most of the cases that we meet with it is necessary to precede the administration of iron and arsenic by laxatives and cholagogues to prepare the digestive organs for the absorption of iron.

Digitalis is a useful remedy, as it strengthens the heart's action and thus regulates the blood-flow to the brain.

Strophanthus, either alone or combined with strychnine, I have found more advantageous than digitalis in many of these cases, as it is less liable to disturb the stomach.

Opium is recommended by Day and also by Anstie. The former says he has never seen any harm follow its use in small doses, even when it has been administered for a long time, provided that it has been given in combination with a stomachic.

Phosphorus is often very useful, but it is very trying to the digestion.

The hypophosphites or phosphoric acid may be given where phosphorus is indicated, and are better tolerated by the stomach.

Nitro-glycerin is a remedy which is indicated by its physiological action, and experience has shown it to be of considerable use. Gowers recommends it highly, and states that he is in the habit of giving it in small doses, $\frac{1}{200}$ to $\frac{1}{150}$ grain, three times a day.

Oxygen inhalations have been employed with advantage in these cases. There is always temporary relief following its use.

Hamilton and A. H. Smith have used nitrous-oxide gas by inhalation in the headache of anæmia, and state that it has been of great use in their hands. Birdsall, however, has made some experiments with nitrous-oxide gas, and found it without value in the cases of headache in which he used it.[1] It should be administered daily, and about 4 gallons of the gas, diluted one-half with atmospheric air, should be used per diem. In the administration of nitrous-oxide gas it should

[1] *New York Med. Journ.*, Mar. 7, 1891.

not be given up to the point of insensibility, but only until there is slight tingling of the lips and tongue felt. Both oxygen and the nitrous-oxide gas can be obtained now in cylinders which may be taken to the patient's house and used very conveniently.

Alcohol is of value in this form of headache, but should be used guardedly, and should be given only with the meals and in a diluted form. Malt extracts are preferable to the stronger spirits. For improving the general health, beef-juice and milk are valuable in aiding to build up the tissues.

For the violent exacerbations of pain we may employ chloral, antipyrine, phenacetin, or exalgin. These latter remedies interfere generally too much with the circulation to be used to any extent, and we are obliged, therefore, sometimes to resort to opiates rather than use the aniline products. If opium must be used, codeine is the preferable form.

In some cases a cup of hot tea or coffee will relieve the more severe attacks, and the citrate of caffeine or guarana is often very useful. In some of the more severe attacks of anæmic headache ether by inhalation gives great relief. In one patient who suffered very severely from headaches of the anæmic and neurasthenic type ether inhaled in moderate amount enabled her to tide over some of the most violent attacks.

Occasionally nitrite of amyl by inhalation is of use, but the odor is too disagreeable to most persons to make it desirable.

When the pain is very intense it is justifiable to administer morphine hypodermically. Frequently small doses—for example, $\frac{1}{12}$ grain—will be sufficient either to relieve the pain entirely or to make it bearable.

Local applications of hot-water bags or sponging with hot water will afford temporary relief. In some forms of anæmic headache lithæmia may be present. This will require special antilithic treatment, and nitro-muriatic acid just after meals, with one of the alkaline waters three hours later, may be recommended. In some cases a strict milk diet is the only means which is sufficient to benefit the condition. When the anæmic headaches are associated with uterine disorders, Hamilton recommends the following prescription:

℞. Ammonii bromidi, ℥j;
Tinct. cannabis indicæ, f℥j;
Mucilaginis acaciæ, f℥iv;
Spirit. menth. pip., f℥ij.—M.
Sig. A tea-spoonful in water three times a day.

Cannabis indica may also be given in combination with iron, and should be continued for a length of time.

Where other means have failed a visit to some chalybeate spring has cured the anæmia and relieved the headache.

Headache of Hyperæmia.

This form of headache is most common in plethoric, middle-aged persons. It is usually met with in men, and but rarely in children and in women. It is often associated with the gouty taint, and is seen in persons given to over-indulgence in food and drink. Want of sufficient exercise, and, in fact, any conditions which tend to plethora of the system, predispose to this variety of headache, which is associated with a general excess of blood throughout the body.

The hyperæmic headache may follow violent bodily exertion or immoderate laughing, coughing, etc. One frequently meets with cases of bronchitis in which one of the most distressing symptoms is a violent pain located at one point, usually in the vertex, which is induced by every paroxysm of coughing. Heart disease, more especially mitral insufficiency, causes cerebral hyperæmia and headache, and any pressure which interferes with the return of the blood through the jugular veins is liable to cause it.

The pain is throbbing and extends over the whole head. The arteries are hard and pulsating, the veins full and tortuous. The temporal arteries are hard and bounding, and frequently the pulsations may be seen. The pain is increased by lying down. There are usually a heavily-coated tongue, nausea, and disturbance of digestion. Associated with the headache are ringing in the ears and often hallucinations of vision and hearing. There is confusion of ideas, and the patient's mental operations are slow.

These headaches may be met with in women at the menopause, and sometimes at the catamenial periods. They are frequently associated with congestive dysmenorrhœa, and are one of the most trying symptoms of this condition.

Treatment.—A violent congestive headache is frequently relieved by spontaneous bleeding of the nose, and therefore any means which will speedily relieve the cerebral congestion are recommended. Cupping or leeching gives prompt relief, and cold affusions or the ice-cap to the head will greatly benefit the attack. The application of a leech at each side of the septum narium and about one-half an inch above the nares is a useful expedient. This, however, is rather a disagreeable and inconvenient mode of procedure, and is hardly to be recommended.

Dr. J. Leonard Corning has suggested an apparatus for artificially inducing epistaxis, which consists of a jar connected with an air-pump and an india-rubber tube connected with a small bottle which is provided with a scale. A bifurcated tube connects the bottle with two

small cupping-bowls, which are sufficiently minute to admit of their introduction into each nostril. As they are provided with india-rubber garnitures, it is possible to adapt them accurately to the size of the septum. The apparatus is used by applying the cupping-bowls; a small scalpel is inserted just beneath the edge of each, and the mucous membrane of the septum slightly scarified. The cupping-bowls are then connected with the vacuum-jar and the air-pump applied.

Dr. William C. Glasgow[1] has also suggested the abstraction of blood from the nose in the treatment of congestive headaches by pricking the cavernous bodies. He says: "If we examine the nasal chamber during the attack of congestive headache, we shall find the cavernous bodies in a state of tension. They may not be greatly swollen or enlarged, but to the eye the condition of the mucous membrane is that of tension and fulness. The degree of tension corresponds in a measure with the severity of the headache. A few years ago I treated these cases with hot alkaline sprays gently applied and the use of hot fomentations combined with the usual constitutional remedies. This mode of treatment has not been altogether satisfactory, and during the past four years I have substituted for it the local abstraction of blood, for which I can allege unqualified success. To produce bleeding no cut is required. The cavernous body is simply pinched, and the blood flows freely until the tension has been reduced, and then it ceases. The amount of blood drawn rarely exceeds one ounce. In many cases a single drachm of blood removed will give the required relief. In cases of extreme congestion the flow will equal several ounces before it ceases."

The ice-water cap is a very pleasant and cleanly method of treatment. It consists of a coil of india-rubber tubing or lead pipe applied to the head, through which a stream of ice-water is allowed to flow.

Pressure applied to the carotid arteries will often relieve the intensity of a congestive headache by diminishing the flow of blood to the brain.

Dr. Corning has suggested a form of electric compression by means of which he compresses the carotids and passes a galvanic current at the same time. It is an ingenious contrivance, but, unfortunately, is not often at hand when the patient is most in need of relief.

The hot bath or the hot-air bath, either in a Turkish bath or in a hot-air box, is useful, provided sufficient care is exercised in its application. The patient should not remain in the hot box too long, not more than four or five minutes, and as soon as he has left the bath he should be put to bed and wrapped in blankets.

Of simple means, which are at the disposal of almost any one,

[1] *New York Medical Journal*, Sept. 3, 1887.

probably the best thing for a congestive headache is to put the feet in a hot mustard bath and then use freely cold applications to the head.

Ergot and bromide of potassium are remedies markedly indicated in this form of headache. Hydrastinin may be given hypodermically, and will be found useful. Antipyrine or acetanilid may be given in 5-grain doses every half hour until 15 or 20 grains have been taken, and they are remedies of great value. Caffeine should be given with the coal-tar preparations to prevent their depressing effect upon the heart. They act more promptly than the bromides.

I have found, however, great advantage from the use of bromide of lithium given in doses of 10 grains every half hour until 30 or 40 grains have been taken; this, combined with a counter-irritant in the form of a mustard plaster to the back of the neck or solution of menthol in alcohol to the forehead and behind the ears, is a reliable plan of treatment.

It should be borne in mind that it is essential to use those remedies which are least likely to disturb the stomach, as this organ is always irritable during the attack. An effervescent combination of salicylic acid and antipyrine or effervescent salicylate of sodium alone is sometimes of value. I have seen speedy and gratifying results from the use of guarana and salicylate of sodium. Guarana is of value on account of the caffeine which it contains, and, according to Gowers, it represents twice as much of this alkaloid as tea and five times as much as coffee.

Compression to the head during a severe congestive headache is often useful. This may be accomplished by encircling the head in a rubber bandage or rubber tubing, like an Esmarch bandage. Hamilton recommends making pressure by applying compressed sponges to the temples, holding them in position with a tightly-applied bandage, and then causing them to swell by wetting them.

Between the attacks of headache it is well to administer calomel and taraxacum at night, followed by a saline in the morning. Bartholow recommends the administration of arsenic for a length of time, while Hamilton and Day believe in the efficacy of small doses of belladonna.

Electricity in the form of galvanism has been found useful in certain cases, and Hamilton speaks favorably of its use both during the attack and as a preventive. He advises the following method of application: "The cathode is to be placed on the superior cervical ganglion of the sympathetic and the anode on the forehead. Very mild currents from two or three cells are sufficient, and under all circumstances the operation should be conducted with great care. The application should last but a minute or two. It may also be made by means of large sponge- or cotton-covered electrodes, one being placed on the top of the head and the other at the back of the neck. Suboccipital headaches are decidedly relieved in this way."

There is a well-known variety of congestive headache which results from excessive indulgence in wine or spirits on the previous night. It is characterized by a sense of intense pressure or weight on the head, nausea, and eructations of gas. It is often relieved by minute doses of arsenic frequently repeated, or by 10-grain doses of Seidlitz powder given every fifteen minutes. Tincture of nux vomica in 1-drop doses administered every fifteen minutes has also proved useful.

Another form of congestive headache is that which is caused by exposure to the sun. Persons who have suffered from sunstroke or who have been overcome by the heat of the sun are especially liable to this variety of headache. I had under my care some years ago a lady who had had an attack of partial sunstroke several years before, who could not go out while the sun was shining without suffering intense headache. In another patient, who had once been overcome by the heat of the sun, a very moderate degree of exposure to the sun would always cause violent congestive headache.

In these cases the headache is dull and throbbing. They are best relieved by cold douches and the application of the ice-cap. Internally the following prescription is useful:

℞. Spirit. ammonii aromat., f℥ss;
Sodii bromidi, ʒvj;
Inf. gentian. comp., ℥iij.—M.
Sig. A tea-spoonful in ice-water every half hour until relieved.

In congestive headaches from excessive brain-work there are generally insomnia, depression of spirits, irritability of temper, and a sensation of difficulty in mental operations. The heart's action is often weak; the carotids throb visibly. The patient experiences dizziness, tinnitus aurium, and muscæ volitantes. The stomach is irritable, the breath foul, the tongue coated, and acid eructations are common. Rest from work should be enjoined, and the following prescription may be given:

℞. Carbonis lig., ℥ss;
Sodii bromidi, ʒvj;
Acaciæ pulv., gr. xx;
Inf. gentian. comp., q. s. ad f℥vj.—M.
Sig. A dessert-spoonful three times a day.

After the pain and extreme symptoms have subsided it is well to substitute for the charcoal-and-bromide mixture the following:

℞. Strychninæ, gr. ss;
Acid. phosphorici dil., ℥ss;
Elixir. calisayæ, f℥vss.—M.
Sig. A dessert-spoonful three times a day.

Or, should the heart's action be feeble and the capillaries dilated, give 5 drops each of tincture of nux vomica and tincture of strophanthus.

Ergot is sometimes useful in small doses, but it is so liable to disturb the stomach that it can seldom be given with advantage. Day is partial to the use of a combination of ergot and spirit of chloroform.

School-children often suffer from headaches of a congestive type. The face is flushed and the eyes suffused. There is throbbing pain through the head, which is worse after eating. The patient often has night-terrors and bad dreams, and there is frequent grinding of the teeth at night. These congestive headaches in children are often caused by enlarged tonsils, which interfere with the return of venous blood from the brain. I have on several occasions seen troublesome headaches in children cured by reduction in the size of the tonsils. When the headaches are caused by over-study and confinement, removal from school is necessary, and small doses of the bromides, together with plenty of fresh air, exercise, and mild calisthenics, will generally afford relief in a short time.

During the intervals of the attacks measures should be used to reduce the blood-pressure and the general plethora of the patient. A proper diet should be very strictly followed, and nitrogenous food, especially meats, should be eaten only in moderation. Wine and spirits should be avoided almost entirely, and but little sugar should be taken. Purgatives are of great value, and salines are particularly indicated. A pill of blue mass or podophyllin should occasionally be given at night.

The treatment which is given at Carlsbad and Marienbad is especially applicable to this form of headache. The regulated exercise, moderate diet, and free use of salines are the means which afford so much relief at these places.

Massage, Swedish movements, and abundant open-air exercise are important for patients in the intervals between the paroxysms.

Toxæmic Headache.

Toxæmic headaches are the result of some acute or chronic condition of the blood. The headache which results from a debauch is a familiar example of a toxæmic headache, as is also the headache from the excessive use of tobacco. The headache following the inhalation of ether or the taking of drugs like chloral, opium, etc. is another illustration of toxæmic headache.

Uræmia is another condition of the blood which causes headache, accumulation of urea in the blood poisoning the nerve-centres. The dull headache associated with albuminuria is familiar to all. Chronic alcoholism, lead-poisoning, and diabetes are accompanied by headaches. The inhalation of poisonous gases, or even an excess of carbonic acid in

a room, are well-known causes of headaches, and every medical student has experienced headaches from breathing the exhalations from bodies in the dissecting-room.

Persons who suffer from lithæmia are subject to headaches from trifling indiscretions in eating or drinking. The most severe cases are seen in those who lead a sedentary life and indulge too much in eating and drinking. The urine is usually of high specific gravity and deposits a brickdust sediment; the bowels are constipated, sleep is disturbed, and the digestion bad. Sometimes there are gouty manifestations in the joints.

Haig has written at length on the relations of headache to the excretion of uric acid. He says the connection between this kind of headache and the excretion of uric acid seems definitely established: "There appears to be retention of uric acid before the headache, excessive excretion during the headache, and diminished excretion after the headache."

Haig says[1] that he himself was a sufferer from migraine, or uric-acid headache, as he calls it, and that it was in trying to find out something about the causation and treatment of his trouble that he began his researches into the influence of uric acid in diseases of the nervous system. He found on experiment that by influencing the excretion of uric acid he could influence the headache also; "that acids which diminished the excretion of uric acid in the urine relieved or removed the headache, while, on the other hand, alkalies increased the excretion of uric acid and made the headache worse. I also found that by retaining or storing up uric acid for a day or two by means of acids I could accumulate it in the body, and by then giving an alkali I could bring out a lot of it into the blood and urine, and could produce headache at will; and proved at the same time that the headache is proportional to the excess of uric acid over urea, and not to the amount of alkali used to bring it out."

This writer states that he has been living on a diet in which milk, with occasionally small quantities of fish or egg, constitutes the only animal food, for seven or eight years, and almost never has a headache. If he eats meat and drinks wine for two or three days in any week, he suffers with a bad headache. He therefore recommends in these cases the use of a non-nitrogenous diet and nitro-muriatic acid. He also finds that a course of salicylate of sodium is useful in clearing out stores of accumulated uric acid.

During the paroxysm of uric-acid headache Haig recommends local applications of mustard, and internally aromatic spirit of ammonia or nux vomica, in place of giving the acid, which he thinks is not

[1] "Uric Acid in Diseases of the Nervous System," by A. Haig, M. D., Oxon., F. R. C. P., *Brain*, spring No., 1891, p. 63.

absorbed by the stomach during the paroxysm. Sometimes he finds that opium or mercury in small doses will succeed in relieving the pain. He very positively forbids the use of salicylate of sodium while the headache is bad, as it will increase the gastric trouble and cause or increase nausea. "The best rule," he says, "is to give acids first and get the stomach into good humor, and then give salicylates."

Uræmic headaches are well known to the general practitioner. There is nothing distinctive about these headaches as regards the location of the pain, but the association of dulness or stupor with them and the symptoms of kidney disease will usually enable one to make the diagnosis. Accompanying the headache are vomiting, tendency to heavy sleep, and more or less œdema. Under these conditions a prompt examination of the urine should be made, and it will probably be found that it is scant in amount, although occasionally the amount of urine may be copious and albumin present in only small quantity.

The best treatment of these headaches is the use of the hot-air bath and the administration of digitalis and purgatives. The hypodermic injection of muriate of pilocarpine is the most prompt way to bring about action of the skin. I may here remark that it is a good rule in all cases of headache to examine the urine as a matter of routine.

The headache associated with diabetes is not of frequent occurrence, and when it is met with is of serious significance, as it generally precedes some grave symptoms belonging to the latter stages of the disease.

Another form of headache which we are justified in considering toxæmic is that due to malaria. This variety is different from all other headaches in the recurrence of the attacks at regular intervals. The pain, as a rule, is frontal, and it may be distinctly neuralgic in character and confined to the distribution of the fifth nerve. The term brow-ague, which is frequently used, describes this variety of headache.

Dr. James J. Putnam[1] denies that the so-called brow-ague, or intermittent headache, is malarious in origin, and states that Dr. Weir Mitchell also takes the same position.

This may be true of some intermittent headaches, but I have so frequently seen them in persons living in malarious places, and in connection with intermittent fever, that I cannot doubt the malarial character of many cases of intermittent headache. I think, too, that they are different from the neuralgias of the fifth nerve, which may be intermittent and even recurring at the same hour on successive days.

The treatment is very clear, quinine in sufficient doses being the important remedy. Frequently, however, these attacks do not yield until arsenic is given in greater or less doses. Sometimes, where

[1] *Boston Medical and Surgical Journal*, Aug. 13, 1891.

quinine has failed in large doses, Warburg's tincture or the inspissated extract in pill form should be given. The dose of quinine necessary to check the paroxysms of headache is often greater than that necessary to break up the chills.

Salicylate of cinchonidine is particularly applicable to the treatment of intermittent headache. It may be given in a capsule or in a freshly-prepared pill. A compressed pill of this drug should never be given.

Most patients suffering from prolonged malaria are anæmic, and iron should be given, combined with small doses of arsenic, for some time.

The headaches from chronic lead-poisoning are dull in character. They should be treated as are other forms of lead-poisoning.

It is not an uncommon thing to meet with headaches from the prolonged administration of arsenic; for example, in the treatment of chorea by large doses of Fowler's solution the patients often have considerable head-pain, which is relieved by reducing the dose of arsenic.

The treatment of headaches the result of inhalation of poisonous gases should consist in the administration of remedies which will rapidly eliminate them. Day refers to the case of an old body-snatcher who frequently had severe attacks of headache from the inhalation of the gases from the bodies he was handling. He found by experience that alcohol in any form increased the pain and nervous depression from the gas-poisoning, but the prompt use of an active purgative would rapidly cure the headache and depression.

A form of headache which is very frequent in women is due to the excessive use of tea. Associated with this are irregularity of the heart's action and a sense of oppression and discomfort about the cardiac region, with irregular or intermittent pulse. There are also gastric disturbance, loss of appetite, and flatulence, with great nervous depression. These headaches are usually relieved by abstinence from tea, careful diet, and the administration of quinine, iron, and strychnine.

Dyspeptic or Bilious Headache.

This variety hardly requires separate consideration, as it has been considered to a great extent under Congestive Headaches. These headaches are the results of over-indulgence in eating or drinking, but may be associated with indigestion and hepatic engorgement, due to insufficient exercise or diseases of the liver. The pain is dull, is not acute, and is usually frontal in its location. It is frequently associated with disturbances of vision, such as scotomata and flashings of light. There is dizziness, and frequently there are nausea, vomiting, and other symptoms of gastric catarrh.

During the paroxysm small doses of arsenic may be given, frequently

repeated. Fowler's solution in doses of from ½ to 1 drop every half hour will sometimes relieve the nausea and headache. Citrate of caffeine and saline laxatives are also useful. Unloading the stomach by an emetic will often afford prompt relief, and small doses of bromide of sodium are then sufficient to relieve the head-pain.

Neurasthenic Headache.

Persons suffering from neurasthenia as a rule have various forms of uneasiness in the head, varying from intense pain to a constant dull aching, or perhaps merely a sense of discomfort and pressure. Some of these headaches have already been described under the anæmic form, but there are others which are not associated with anæmia, but appear to be due to the depraved condition of the nervous system.

In hysteria we meet with the form which is very characteristic, known as clavus hystericus. It consists in an intense localized pain, and has been compared to that which would be caused by a nail driven into the head; hence the name. It is generally described as being in the vertex.

For the treatment of these headaches we must direct our attention to the general state of the patient, as it is impossible to give more than temporary relief until the condition of nerve-exhaustion has been benefited. Of all the means which have been tried, there have been none so successful as the rest treatment recommended by Dr. Weir Mitchell.

There are many patients who are unable, either on account of the expense or the time required, to take a thorough course of the rest treatment, and who yet very much need the building up and renewal of the tissues which this treatment can accomplish. In these cases Dr. Mitchell recommends what he calls "partial rest-treatment." This consists essentially in giving the patient a large amount of digestible food, with more rest than is ordinarily taken, and employing massage. The patient is instructed to take a small cup of cocoa on waking in the morning, after which rest for twenty minutes is enjoined. Then a sponge-bath while lying on a blanket, followed by brisk friction of the skin. After this, dress and rest for twenty minutes before breakfast. After breakfast an hour's rest. Massage should be given, if possible, about ten o'clock in the morning, and an hour's rest is to be taken after this treatment. After each meal an hour's rest is enforced also. Electricity is sometimes employed, but not invariably; and if it is given, the best time for it is just before the evening meal. Four or five glasses of milk should be taken during the course of the day, and from one to three ounces of the fluid extract of malt should be taken with each meal. If the stomach will bear it, cod-liver oil is a useful adjuvant in the treatment of these cases.

At times these patients have severe paroxysms of pain, and it will

then be necessary to use special means for their relief. Occasionally, massage to the head will be comforting, and the galvanic or faradic current may be used with advantage. It is desirable in these cases to avoid as far as possible the administration of drugs during the attack, as the patients speedily acquire the habit of using almost any medicinal agent which is given for the relief of pain. When, however, there is evidently acute suffering, we are compelled to use some means to check the pain, and then we will find of importance antipyrine or acetanilid in 5-grain doses, repeated every half hour until 20 grains have been given. Often it is well to guard the patient against the depressing effects of antipyrine by giving a grain of quinine or caffeine with each dose.

A diffusible stimulant, like a glass of sherry or champagne, will often quickly relieve the intensity of the pain, but, as before remarked, alcohol is objectionable in these cases, as the habit of using it is readily formed. Guarana, caffeine, and small doses of cannabis indica may also be used, and phosphoric acid in small doses is often useful. Hamilton gives a very good formula to be employed continuously, which consists of a pill of the arsenate of strychnine, strophanthus, and quinine.

Sympathetic or Reflex Headaches.

Formerly, headaches of this kind were considered as belonging to neurasthenic patients alone, but of late years the relations of headache to eye-strain have been so carefully studied that our knowledge on this subject has been much increased. It is now a well-established fact that severe and constant head-pain may be caused by slight errors of refraction and by nasal and ear diseases, and it has been recognized for many years that headaches may be the result of uterine disease.

The pain from eye-strain is usually felt over the brow. It does not spread to the vertex, but is generally confined to the forehead or immediately over the brow, and is sometimes felt in or behind the eyeball itself. Sometimes it is referred to the occiput. Examination of the eyes in these cases reveals some form of refraction error or muscular insufficiency.

Julian J. Chisholm[1] considers that astigmatism is a very common and often unrecognized cause of headache, and that the class of persons in which it occurs are healthy people, young, active, and industrious. They all suffer more or less with eye-pains and headache, which they call neuralgia—a term which they have learned from their family doctor.

Hypermetropic persons most frequently suffer from pain, aggravated by the use of the eyes and bright lights, and astigmatism is usually

[1] *International Clinics*, April, 1891.

associated with this condition. Myopic persons may also have dull pain in the head from excessive use of the eyes, and along with the pain there are vertigo and other uncomfortable head symptoms. Frequently there are evidences of inflammation about the lids and conjunctivæ. Correction of the ocular defects does not always immediately cure the pain in the head: it is frequently necessary to pursue a course of constitutional treatment.

Dr. W. F. Mittendorf has recorded the results of the study of 1000 cases of ocular headache.[1] He says that an unusually large number of school-children and college-students, as well as women who have had but little out-door exercise and whose muscular system was undeveloped, were among his patients. He lays much stress upon out-door exercise and gymnastics, as well as glasses, in the treatment of these cases. A number of his patients, he says, would be perfectly free from headache and able to lay aside their glasses could they devote much time to gymnastic and out-door exercise, but if obliged to keep close in school they have to continue the use of their glasses.

He also refers to the well-known fact that many people go through life with hypermetropia and astigmatism without inconvenience, but if their health becomes impaired from some cause or other, or if they abuse their eyes, asthenopic troubles come on at once.

The errors of refraction of the 1000 cases were as follows:

Myopia,	2 per cent.,
Hypermetropia,	11 "
Astigmatism,	83 "

of which 119 cases were myopic and nearly 700 were cases of hypermetropic astigmatism.

This writer says that among the most distressing symptoms in cases of ocular headaches are frontal, supraorbital, temporal, and occipital pain, which sometimes extends from the back of the head along the spinal column; disturbance of the stomach, producing at times nausea and even vomiting; pain, extending even to the limbs; twitching of the lids; distressing nictitation, and even choreic movements of the face; depression, bordering on melancholia; and other troubles usually classed as general nervousness.

He also refers to a "Sunday-morning headache," which he believes is the result of the unusually hard work of the preceding Saturday preparing for Sunday, so that the eyes as well as the rest of the body get thoroughly fatigued. He says that he has had a number of cases where a cylindrical glass has led to the cure or prevention of Sunday-

[1] *Medical Record*, July 18, 1891, p. 59.

morning headaches which had existed regularly for several years, and which had been ascribed to some obscure malarial influence.

He finds relief for an attack of headache due to eye-strain from a lotion composed of lavender, rosemary, camphor, and alcohol, applied to the closed lids and forehead.

Harrison Allen[1] has described headaches the result of nasal disease. He refers to a patient in whom merely touching the right middle turbinated bone instantly caused intense vertex pain. He relates a second case in which there were attacks of general headache and clavus, in which he found disease confined to the middle turbinated bone on the right side.

Guye of Amsterdam,[2] to whom we are indebted for the word "aprosexia," denoting an inability to fix the attention on any more or less abstract subject, considers that with this impairment of the attention, so often due to nasal stenosis, go feebleness of memory and a tendency to headache. He cites the case of a girl, aged fifteen years, who had complained of almost daily headache for two years. She had always been a mouth-breather, and would forget by morning the lessons which she had learned the evening before. The pharyngeal tonsil was removed and appropriate treatment was directed to the nasal stenosis. One week later she returned with bright looks, and stated that she had had no attacks of headache, and that she was now getting the highest marks in her studies instead of the lowest.

Roe[3] has also written fully on headaches dependent upon chronic diseases of the nasal passages.

Stomach and liver disorders will produce a plethoric condition of the system and cause distension of the cavernous sinuses of the nose, thus producing intranasal pressure and sympathetic headache. In these conditions the pricking of the cavernous bodies, as described in the treatment of Congestive Headache, is to be recommended as a temporary expedient in these cases, but both Allen and Roe declare that the permanent cure of these nasal headaches can only be accomplished by relieving the intranasal pressure by the removal of hypertrophied tissue, or other means for the relief of the nasal disease.

Lauder Brunton refers to cases of headache the result of decayed teeth, and declares that "the most common causes of headache, indeed, are decayed teeth and irregularities of vision."

In speaking of headaches from carious teeth I do not refer to the neuralgic pains which are familiarly known in connection with aching teeth, but to the headaches which involve the entire head and sometimes assume the character of migraine, and which depend upon decayed teeth, and are relieved by the proper treatment of the teeth.

[1] *The Medical News*, Jan. 30, 1886, p. 136. [2] *The Practitioner*, Sept., 1891.
[3] *Medical Record*, Jan. 25, 1888.

A. P. Brubaker has reported some cases of epilepsy which were dependent upon decayed teeth, and were cured by the removal or treatment of the offending teeth.

Sometimes the irritation connected with the cutting of the wisdom teeth gives rise to headaches of a diffusive and constant character, which only cease when the teeth are entirely through. Headaches from ear disease, obstruction by means of wax or foreign bodies, are well known to specialists in ear diseases.

In the case of headaches dependent upon diseased ovaries the pain is generally of a dull character, frontal in its location, and usually constant, but may be intermittent. It is seldom very intense, but is persistent and annoying.

Treatment directed to the inflamed or diseased organ will often relieve the pain in the head. However, I have met with a number of instances in which the head-pain persisted after the removal of the diseased ovaries by laparotomy. A very useful prescription for the headache dependent upon ovarian disease is the following:

℞. Ammonii bromidi, ʒvj;
Ext. hydrastis fl., f ʒss;
Tinct. gentian. comp., f ʒiss;
Aquæ, f ʒiv.—M.
Sig. A dessert-spoonful three times a day.

Blisters over the ovaries will sometimes give relief, and massage carefully and thoroughly applied to the ovarian region, together with the "wet pack," is often capable of alleviating the irritation of the organs and the pain in the head. Pressure on top of the head frequently allays the pain in this variety of headache, and Dercum[1] says that when one meets with a headache located in the vertex, and which has the peculiarity of being relieved by pressure, the attention should always be directed to the uterus and ovaries.

J. A. Wessinger[2] considers that headache due to derangements peculiar to young women and girls at puberty can best be relieved by careful supervision of study and exercise, and by the internal administration of iron in the form of either the modified Blaud pill or the tonic chalybeate tablet of Flint.

Organic Headache.

Tumor of the brain is almost invariably accompanied with pain, either local or diffused. The location of the pain, however, does not always correspond to the seat of the growth. I have more than once

[1] "Headache, its Varieties," *University Medical Magazine*, 1891.
[2] *New York Medical Journal*, Aug. 8, 1891.

seen pain referred to an entirely different region of the head from the seat of the disease. As a rule, however, the pain is referred to the location of the tumor.

When using the term "organic headaches" I refer to all headaches in which there is a structural lesion present, including headaches from meningitis. In acute meningitis the pain is of course one of the most prominent symptoms, but we have a chronic variety of meningitis which gives rise to a dull aching pain that persists for a long time and is accompanied with various subjective symptoms, such as intolerance of light, noises in the ears, dulness of hearing, or there may be unusual acuteness of hearing. I believe there is more often present than is generally recognized a subacute or chronic meningitis of low grade, giving rise to a constant headache which may last for years.

Besides these forms of organic headache, there may be headaches the result of syphilitic gummatous growths under the scalp. Some of the characteristic symptoms of headaches due to syphilis are the greatly increased pain at night and disorders of certain ocular muscles, such as ptosis and paralysis of the sixth nerve, impairment of smell-sense, together with vomiting, disturbance of speech, and a dulness of intellect. The nocturnal exacerbations are seldom absent in this variety.

The treatment of headaches due to syphilitic disease consists in the administration of iodide of potassium and mercury, either combined or given separately. It is important to bear in mind the necessity of giving the iodide of potassium in large doses. The most convenient, and now the most general, way of administering the iodide is in a saturated solution, of which 1 minim represents 1 grain of the salt. The dose can be rapidly increased by beginning, say, with 10 grains three times a day, and adding 1 grain to each dose. It is sometimes found that a patient will tolerate from 100 to 140 grains three times a day, and frequently the symptoms are not markedly relieved until the largest doses are being taken. As soon as iodism is caused we should reduce the dose, and cautiously increase it again; but my experience has been that once iodism has been produced it is generally impossible to reach the same dose again without giving rise to the constitutional symptoms of the drug, such as coryza, acne, and offensive breath.

The iodide is sometimes conveniently given in milk, as the taste is less disagreeable, and it is then also better borne by the stomach. It may also be given in effervescent alkaline water, such as Vichy, and is less unpalatable in this way than in plain water.

In some cases it is necessary to use mercury in full doses before relief is obtained. Mercurial inunctions give the best results, using either the unguentum hydrargyri or oleate of mercury, 10 per cent.

strength. A good way to use the oleate of mercury is to dilute the 20 per cent. solution with lanolin.

The intolerable pain in some cases can only be allayed by full doses of morphine, but it is well to try, before resorting to this, local means, such as the ice-bag alternated with the hot-water bag.

In the treatment of the headache of meningitis, belladonna and ergot are useful drugs. The latter should be given in doses of from $\frac{1}{2}$ to 1 drachm three times a day. The stomach, however, is often unable to bear these large doses. Small doses of the bichloride of mercury, continued for a length of time, are valuable. Doses of $\frac{1}{100}$ grain of this drug, repeated every two hours, have been strongly recommended by a writer whose name I do not recall.

Counter-irritation is of much value in the headache due to chronic meningitis, and the actual cautery is the best means of employing this. The button of the Paquelin cautery should be brought to a white heat and touched lightly to the nucha at two or three points. This may be repeated every four or five days. Cups may be applied to the back of the neck, and occasional bleeding, after the method recommended by Dr. Glasgow and which is referred to in the treatment of Congestive Headache, may be used.

Even when there is no suspicion of syphilis the headache from brain tumor is frequently relieved by large doses of iodide of potassium, and in some cases a combination of the iodide and bromide of potassium is of more benefit than either of these remedies used separately. It has been asserted that when given in combination iodism is less readily produced than when iodide of potassium is given alone.

The iodide of lithium, in doses of 10 grains, may be given when the potassium salt is not borne by the stomach.

We must remember that there are cases presenting most of the features of periodical headache which depend upon some organic cause, such as tumor or exostosis. In cases in which there is doubt the examination of the eyes will reveal the presence of optic neuritis or swollen disk if a tumor is present.

Headache Dependent upon Disorders External to the Skull.

The most common of these headaches are the neuralgic headaches, and, properly speaking, they should be considered under the Neuralgias. There are, however, cases of neuralgia of the scalp, depending upon exposure to cold or draughts, which involve the entire scalp rather than the distribution of any one nerve.

These headaches are best treated by the application of heat—as, for instance, the hot-water bag—and the administration of salicylate of sodium or phenacetin combined with salol.

Rheumatic headaches which affect the scalp or fibrous aponeurosis and the occipito-frontalis and temporal muscles are met with occasionally in patients who have a rheumatic diathesis. They are frequently the result of exposure to cold or sudden checking of perspiration, but may be independent of any exposure and associated purely with the accumulation of rheumatic poison in the system.

The pain is characterized by intense aching, and there is tenderness of the scalp, often extending into the jaws. The teeth also ache. The face is sometimes flushed. The pain increases in the evening and grows less toward morning. The urine is usually high-colored and loaded with urates, and the temperature may rise one or two degrees above normal in the evening.

The ordinary antirheumatic remedies are of value in these cases—the salicylate of sodium, or, what is better tolerated by the stomach, the salicylate of ammonium, given in effervescent Vichy. In chronic cases we should give colchicum in small doses, and it may be combined with the iodide of potassium. It has been rather the fashion of late to decry colchicum as pernicious, but I am satisfied that it is only because of the abuse of this remedy in times past that it has fallen into disrepute. It is certainly one of the best remedies we have for gout. A sudorific at bedtime is of great relief, and enveloping the head in a hot flannel or lying upon a hot-water bag will also afford ease in many cases.

If the case is persistent and the patient is able to leave home, he may go with advantage to some of the springs, such as Saratoga and Richfield. Some of the stronger lithia waters may be drunk at home with decided benefit.

Norstroem[1] thinks that some headaches are due to inflammatory thickening at the insertion of the muscles, generally the result of taking cold. He has obtained excellent results from massage of the indurated places.

One other form of headache from extra-cerebral conditions is that dependent upon diseases of the periosteum. This is usually syphilitic, and has been considered among the organic headaches due to syphilis. The pain is very intense, and is worse at night; there is acute tenderness on pressure over the scalp, and frequently marked swelling is detected. Occasionally, there are gummatous growths in different parts of the head connected with the periosteum. These, on palpitation, frequently give a sense of fluctuation, and there is a strong temptation to open them with the idea of liberating pus and thus afford relief. If the pain in these cases does not yield promptly to the internal administration of iodide of potassium, the scalp may be shaved and mercurial ointment freely applied.

[1] *Lancet*, Sept. 27, 1891.

Migraine.

This variety is considered by many authors in the class of neuralgic headaches, but it is so distinctive and important that I think it should be considered separately.

It does not by any means partake of the characteristics of the neuralgias, and the various reflex symptoms which accompany the attacks are as essential features as the pain. Indeed, as will be shown later, the attack may occur without headache.

The origin of the name is interesting. It is derived originally from the Greek *ἡμικρανίον*, expressing the fact of the pain being confined to one side of the head. From this arises the Latin *hemicrania*, then by Low Latin, *hemigrania*, from which comes the French *migraine*, or *megrim*, as it is frequently called in England.

It is distinctly paroxysmal, and is associated with other phenomena of a nervous kind besides the pain. The attacks occur at different intervals, usually once in three or four weeks, but they may return as often as once a week or even three or four times in a week, the frequency of the attacks depending usually upon the condition of the patient's system. I have recorded several cases in which the attacks recurred with regularity on a certain day of the week.[1] Liveing has also referred to this fact. Tissot[2] says that Salius relates the case of an Italian monk who for three years and seven months had an attack of violent hemicrania every Monday, the attacks lasting from twenty-eight to thirty hours. No doubt these paroxysms were the result of the unusual labors of the preceding day or of some change in the time and mode of taking food that day. Mittendorf, whose paper has been quoted, speaks of having had patients whose attacks occurred with regularity on Sunday.

The cases which I reported were six in number. In some of them the attacks were apparently due to the occupation of the previous day; in others they came on Sundays, and were possibly the result of the unusually late hour at which the patient rose on this day; but in one or two instances there was no reason, either from the work on that day or on the previous one, why the attack should occur on that particular day in the week except as a matter of periodicity.

A paroxysm of hemicrania is often preceded for a day or two by a sense of unusual depression, physical and mental. Sometimes for two or three days the patient awakens in the morning with a dull headache which passes off later in the day. Occasionally there are some disorders of digestion for a day or two, and it very frequently follows a period of severe mental or physical work, especially when there has been any irregularity or imprudence in regard to eating or drinking. Undue excite-

[1] *The Medical News*, July 19, 1889. [2] *Traité des Nerfs*, vol. viii. p. 102, 1788.

ment, either of a pleasant or painful kind, is a cause, and long railroad journeys often precipitate a headache. Some patients experience unusual hunger the night before an attack, and even when no food is taken at bedtime they do not escape the headache next morning. The paroxysm is frequently ushered in by certain disturbances of vision or by evidences of general nervous disturbance, such as shivering, cold feet and hands, flushing of the face, and tremor.

The ocular symptoms are of special interest. The most common of these are the various forms of scotomata. Sometimes they take the form of a bright spot or many bright spots floating before the eyes, or zigzags of bright light. The scotomata may take forms which are regularly repeated, being sometimes like a bow with a double line, and at other times a circle with a dark and lighter line, and various other shapes.

Not unfrequently there is bilateral hemianopsia, which lasts for several minutes, perhaps longer, preceding the headache. The patient is able to see only objects on one or the other side, as the case may be. The hemianopsia is seldom complete; that is, the "blind side" is only blurred, and is not completely obscured.

Some very remarkable visual hallucinations preceding an attack of migraine have been described. Dercum relates the case of a patient, a married woman, who while alone in her room will see two of her children at her right side. So natural is the illusion that she turns to look at them. She has found, however, that the appearance of this spectre means that a headache is about to come on.

Mitchell reports a case of a woman who was subject to the hallucination of a large black and very hairy dog that appeared just before a severe paroxysm of migraine. The apparition usually, but not invariably, appeared as she was going up stairs. DeSchweinitz mentions a curious case in which the patient always saw a large green snake before the attack. In another animals, always either mice or dogs, were seen before the headache.

The pain may begin at any time of the day, but usually comes on in the morning. As a rule, it begins with pain over one eye, sometimes in a small spot, and this extends until the entire half of the head is involved. After the pain has become severe it is difficult for the patient to say whether the pain is confined to one side only or whether it involves the entire head. In some cases the pain begins in the occiput, and remains almost entirely in the posterior part of the head. With the pain there are coldness of the extremities, flushing of the face, and more or less nausea. In some cases, however, the face is pallid during the entire attack; and this fact has given rise to the division by some writers into two forms of migraine—the congestive type and the anæmic type, the angio-paretic and the angio-spastic.

The eyes are bright or may be suffused and light is painful to the patient. Occasionally there are hallucinations of hearing, and noises are intolerable. Day refers to the case of a lady who during the paroxysm could hear with such intense acuteness that the ticking of a clock in another room was distinctly audible, while at other times, when free from headache, she was unable to hear it.

During or preceding the attack there are other sensory disturbances felt in the limbs, tongue, and other parts. Usually the disorder of sensation is in the arm, but occasionally it is in the leg, and it may take the form of a complete hemianæsthesia. A sense of tingling or "pins and needles" is felt in the hand, fingers, and extending up the arm. It may be felt in the lips, cheek, or even the tongue.

The duration of these sensations is usually brief, lasting only fifteen or twenty minutes, but they may persist during the entire attack, and occasionally there is a sense of weakness associated with the paræsthesia. Transient aphasia is another symptom which is sometimes met with, and it occurs in those cases in which the sensory disturbances are right-sided. The aphasia lasts, as a rule, only for a few minutes. I have one patient who has frequent seizures of migraine which are quite often preceded by numbness, confined to the right arm and leg, together with temporary aphasia. These disturbances of speech and sensation, however, do not occur with every attack of migraine that she has, and sometimes she has one-sided numbness and disorder of speech, lasting a few minutes, but not followed by headache.

Gowers says: "The rule of right-sided association probably does not hold good of left-handed persons, and is not quite absolute in other cases. I have met with one case in a right-handed man in whom the attack began with left-sided hemianopsia, followed by tingling in the left foot, which passed up the leg and side to the mouth and tongue, and then the speech was deranged."

There are often during the attack slight mental disturbances; confusion of ideas and temporary loss of memory. There may also be mild hallucinations. The patient may be harassed by a word or a sentence which he is continually repeating. Another mental condition during the attack, and sometimes preceding it, is that state which has been described as a sensation of double consciousness—a sensation as if everything the patient was saying or thinking had been said or thought before—and there is an indescribable effort to catch the thread of an idea which seems to be constantly fleeting from the memory. This condition has been ascribed to a want of harmonious action in the two hemispheres of the brain.

After these premonitory symptoms have lasted for a varying length of time, from a few hours to an entire day, the pain becomes agonizing and at times almost unendurable. There is nausea usually at the crisis

of the attack, although in a lesser degree it may accompany the entire paroxysm, but when it occurs at the acme it results in vomiting. Sometimes a considerable amount of mucus and bile is vomited, but often there is only retching. After the vomiting the pain for a short time is greatly aggravated, but within a few moments the patient breaks into a perspiration, falls asleep, and awakens well. Occasionally, however, the vomiting is not followed by relief, especially if it occurs during the early part of the attack, and there may be frequent ineffectual attempts at vomiting without relief.

The general condition associated with the nausea is one of extreme prostration, wretchedness, and mental depression. In some cases the crisis is attended not by vomiting, but by an excessive amount of some secretion; for example, urine or perspiration. In some instances an excessive diuresis occurs at the crisis without any nausea or vomiting, and I have met with cases in which two or three profuse watery stools occurred at this time, and shortly afterward sleep ensued, followed by entire relief from the pain. The paroxysm lasts from a few hours to an entire day, ceasing when sleep comes. In severe attacks the pain may be continuous for two or three days.

In many persons the condition after a paroxysm is much better than before it. The patient feels stronger and brighter than he has for some time, and his mental faculties seem much more active than previously.

The interval between the paroxysms is usually from two weeks to two months, though they may occur much more frequently, and sometimes not for three or four months. In women they come on about the catamenial periods, and sometimes continue after menstruation has ceased. In a patient of my own the attacks of headache occurred with regular periodicity at the time the monthly periods should have occurred for years after the cessation of the catamenia.

As before remarked, the general condition of the patient largely influences the attacks, so that the frequency of their occurrence depends to a great extent upon the patient's general health. Indiscretions in diet or over-fatigue, either physical or mental, may cause the paroxysms to occur much more frequently, and, on the other hand, an out-door life and freedom from care and worry may bring immunity for months at a time.

Many cases of migraine seem to depend upon the gouty diathesis, and any condition which produces lithæmia will precipitate an attack of migraine. Drinking certain of the heavier wines or eating too much rich and indigestible food will cause typical migraine, and with it characteristic evidences of lithæmia.

It is important to remember the association between migraine and epilepsy. This connection has been denied, but many of the phenomena preceding the attacks are so similar that we cannot but regard

the two conditions as more or less allied to each other. Moreover, patients who suffer from migraine frequently have a family history of epilepsy, and both disorders may occur in the same person.

Gowers mentions several instances in which migraine had existed for many years and the patients afterward became epileptic. In some cases of epilepsy we see the attacks preceded by sensory and ocular symptoms, such as have been described above.

As to the prospects of recovery from migraine, everything depends upon the surroundings of the patient. If he can lead a perfectly wholesome life, free from care and anxiety, the disorder may be cured entirely. There are cases, however, in which, in spite of all favorable conditions and every form of treatment, the disease persists during the patient's entire life. As a rule, however, the affection is self-limited. It seldom lasts after the age of forty-five, and frequently becomes very much less severe even before this age. It is a disease of early life, usually beginning at or before the age of puberty and extending into middle life. Children frequently suffer from it at an early age, and sex seems to exert no influence in the causation of the affection.

In women the paroxysms frequently cease after the menopause, but they often continue to have headaches, although different in character from those from which they formerly suffered. As a rule, in both men and women the attacks of migraine are replaced by neuralgia, usually in the supraorbital branch of the fifth nerve. Occasionally a constant occipital headache takes the place of the migrainous attack, and persists steadily for many years. Even when the paroxysms do not cease entirely, after the age of fifty there is some change in the character of the affection. The sensory symptoms, for instance, may cease or change their form, or the vomiting during the attack may cease. It may be taken for granted in the management of this affection that after the age of forty-five the paroxysms will be fewer, less severe, and more amenable to treatment.

In almost all cases careful study of the individual will reveal the necessity for improving the general health, or by regulating his habits as to work, diet, and exercise bring about a more satisfactory condition of the general health, which will in some measure influence the attacks.

Special attention should be given to the food, and the peculiarities of the individual carefully studied in selecting a diet for each case. In patients of a gouty tendency of course it is essential to restrict or entirely prohibit the use of wine, beer, and spirits. Excess of sweet and starchy articles of food should be equally avoided, and, in fact, such a diet as would be selected for a patient suffering from gout in any of its other forms should be chosen. In all cases easily-digested

food is obviously important, and late suppers, pastry, and rich food of all kinds should be shunned.

In anæmic patients—and many sufferers from migraine are deficient in red blood—milk with raw-beef soup or meat juice, in addition to a full and wholesome dietary, should be given. In these cases the rest treatment, either fully or partially given, as recommended in the section on Neurasthenic Headaches, is of marked and often remarkable benefit. It has frequently occurred to me to see patients whose attacks of migraine had not yielded to medication, after a course of rest and treatment improve greatly under the same remedies that had failed previously.

The therapeutics of migraine is naturally divided into medication for the paroxysm and the treatment during the intervals. The drugs which have been recommended are very numerous. The use of the bromides has been disappointing as a continuous treatment. Their value in epilepsy would lead us to infer that they might be of value in migraine, but they are not efficacious in prolonging the intervals, and besides have the disadvantage of disordering the digestion and impairing the general health.

The most useful remedies during the intervals are tonics and nervines. In anæmic or chlorotic women iron and arsenic should be given for a length of time—say for three or four months—and cod-liver oil, if the stomach will tolerate it, is of prime importance. Even in patients who do not show evidences of anæmia iron is of value, combined with quinine and nux vomica or strychnine. The compound syrup of the hypophosphites—that is, the hypophosphites of lime, strychnine, iron, and quinine—is a useful preparation, should be given diluted in water, and may be continued for several weeks at a time. In some cases the stomach will bear a simple solution of the hypophosphites better than the syrup, and I prefer to give the hypophosphites in this way.

Of all the drugs which have been suggested in the treatment of this affection, by far the most frequently useful is cannabis indica. It was first recommended to be given continuously for months by Dr. Greene in *The Practitioner* in 1872. He again wrote in the same journal in 1888 to endorse what he had previously stated as to the efficacy of this drug. He maintains that it is not simply palliative, but curative, and that in nearly all cases it will give permanent relief. Dr. Seguin[1] has given his experience in the use of this remedy, and recently has written strongly in favor of its systematic use. He advises that cannabis indica be given for a prolonged period. He prefers to administer it in the form of the extract, beginning with $\frac{1}{6}$ grain three times a day, and gradually increasing the dose. He believes that the good effect of

[1] *Medical Record*, N. Y., Dec. 8, 1877.

this remedy is largely due to the influence which it exerts as a mydriatic.[1] He refers to the frequency with which headaches are produced by eye-strain, and the relief which is afforded by mydriatics and correction of the ocular defects; and he thinks that belladonna, cannabis indica, and hyoscyamine relieve headaches by the sedative influence which they exert upon the third nerve and the muscles which it supplies, including the iris. He remarks, by the way, that he believes that all cases of migraine are associated with refractive errors, and explains the immunity from headaches after the age of forty-five to fifty years by the fact that after this time the accommodative power is usually lost.

In the administration of cannabis indica it is of importance to bear in mind the difficulty of obtaining a reliable preparation, as there is hardly any drug more variable in its strength than this. Herring's English extract and Squibbs's are reliable preparations, and there are also several others; but it is a good rule to see the druggist from whom you are about to prescribe the cannabis indica and ascertain whether he has a fresh extract. If one prefers to administer this remedy in liquid form, it is well to have a tincture made from a reliable extract. The drug may be given alone, and it is best to increase the dose gradually until the maximum of toleration is reached; that is, a dose a little less than that which produces a slightly dreamy, light-headed state. I would especially advise caution in the earlier doses of this remedy, as some patients are extremely susceptible to its influence, and the toxic effects produced by it are, in my experience, different from those described in the textbooks.

When given on an empty stomach the effects are very quickly produced, and I have found the results of an over-dose to be a sense of cardiac oppression, extreme palpitation, great anxiety, a sense of impending death, cold extremities, and clammy skin. These symptoms may last for two or three hours, the patient being obliged to remain in the recumbent position, and any attempt at raising the head causing an aggravation of all symptoms. After a few small doses of the drug the quantity taken may be gradually increased, and a large dose will be borne without any of the discomforts above described.

A useful way to give cannabis indica is in combination with arsenious acid and iron. The following is a good prescription:

℞. Ext. cannabis indicæ,	gr. $\frac{1}{6}$;
Acid. arsenious,	gr. $\frac{1}{60}$;
Ferri pulv.,	gr. 1.
Fiat pil. No. j.	

Sig. Give one pill three times a day—the dose may be increased to two, or even three, pills three times a day.

[1] "Lectures on Some Points in the Management and Treatment of Neuroses," *New York Med. Journ.*, May, 17, 1890.

Another good formula which may be kept up for a long time is—

R. Ext. cannabis indicæ,	gr. $\frac{1}{6}$;
Pulv. digitalis,	gr. ss;
Ferri lactat.,	gr. ij.
Fiat pil. No. j.	
Sig. Take one pill three times a day after meals.	

Cannabis indica may be advantageously combined with nux vomica, and in some cases where there is a hyperæmic condition of the brain ergot may be added, as in the following formula:

R. Ext. cannabis indicæ,	gr. $\frac{1}{6}$:
Ext. nucis vomicæ,	gr. $\frac{1}{4}$;
Ergotini,	gr. j.
Fiat pil. No. j.	
Sig. Take one pill three times a day after meals.	

This may be continued for some time.

In giving cannabis indica we must remember that its utility depends upon its continuous use for many months, and we should impress upon our patients the importance of taking the remedy without intermission for a long time.

The correction of ocular defects, no matter how slight, should be insisted upon. Nearly all oculists at the present day are fully impressed with the importance of correcting even the slightest errors of refraction in cases of headache, but practitioners as a rule do not realize the importance of doing this; and I desire especially to endorse what Dr. Seguin has said in regard to examining the eyes in cases of headaches under the influence of a mydriatic.

After a thorough investigation into the condition of the patient's eyes, we should examine the other organs with care, especially the nose, and search for evidences of obstruction or other disease in the nasal passages. It is not always necessary to use surgical means in these cases, as we can often afford great relief by the use of antiseptic sprays or washes applied to the air-passages. Vansant[1] treats cases of headache of nasal origin by forcible syringing of the nasal accessory cavities with hot, dry air. In some cases the air is medicated or nitrous oxide gas is used. Frontal headaches, the result of hyperæmia of the frontal sinuses, are especially relieved by this treatment.

In the treatment of migraine in lithæmic cases the use of nitro-muriatic acid, continued for a long time, is of considerable utility, but there are other cases in which the salts of lithia are of more

[1] *Phila. Med. Jour.*, 1895, p. 842.

value; and some of the lithia waters so commonly employed now-a-days are undoubtedly beneficial in the treatment of the gouty forms of headache.

In this, as well as in other varieties of headache, it is of great importance to keep the secretions free, and if there is any tendency to constipation mild laxatives should be employed, and the occasional use of podophyllin or a mercurial is of advantage. A very excellent pill for continuous use is the following:

℞. Aloin, gr. $\frac{1}{5}$;
Ext. belladonnæ, gr. $\frac{1}{8}$;
Fel. bovis inspissat., gr. ij.
Fiat pil. No. j.
Sig. One or two pills at bed-time.

Phosphate of sodium given every morning acts freely upon the biliary secretions and is highly recommended by Bartholow.

For the treatment of the paroxysm a large number of remedies have been advised. Until recently the different combinations of the bromides were in great repute, but the addition of the aniline products to the Pharmacopœia has replaced the former to a great extent. Among the coal-tar products those of principal importance are antipyrine, phenacetin, and acetanilid. White[1] and Robertson[2] were the first physicians who gave antipyrine in headaches. It is now universally employed in the treatment of headaches of various kinds and in neuralgias. It has the disadvantage of being a proprietary remedy of which we do not know the exact composition, but having the great merit of being perfectly soluble and tasteless, it is readily taken and is rapidly absorbed.

Not more than 5 or 10 grains of antipyrine should be given at a dose; it may be repeated every half hour until 20 grains have been taken, but I do not think it can be used in all cases with safety in larger doses than these. Its efficacy is said to be increased by the addition of 10 or 15 grains of sodium bicarbonate to each dose. Antipyrine may be advantageously combined with salicylate of sodium, and an effervesent salt of the two has been prepared which is quite palatable.

Phenacetin should be used in the same doses as antipyrine. In my experience it is a less depressing remedy, and does not produce cyanosis as frequently as antipyrine and antifebrin. Phenacetin may be administered in a capsule, or a finely triturated powder may be placed upon the tongue and washed down with a swallow of water. Its action is perhaps not quite as rapid as that of antipyrine, but it is

[1] *Annual of the Universal Medical Sciences*, vol. iv. p. 444.
[2] N. Y. *Med. Record*, 1887, vol. i. p. 517.

satisfactory in most cases. It has been found useful in the headache associated with the "grippe." Phenacetin may be given in combination with salicylate of sodium or salol with advantage.

Acetanilid has been used very freely in cases of migraine, and most of the largely-advertised proprietary remedies for headache probably consist essentially of this preparation. It is objectionable on account of its depressing influence upon the heart in some cases, and a tendency to produce cyanosis. I do not consider it so safe a remedy as either phenacetin or antipyrine. This preparation may be used, however, by giving caffeine with it, and there are a great many cases which it suits very well.

Caffeine is a very efficacious remedy if given early in the attack, but it seldom does good after the headache has become severe. Seguin thinks it is most useful in those cases in which the ocular phenomena are prominent as premonitory symptoms, such as hemianopsia or hazy vision.

Dr. E. J. Overend,[1] who is himself a sufferer from migraine, expresses the opinion that caffeine is as complete a specific in migraine as quinine in malarial fevers. He advises the use of citrate of caffeine in doses of from 3 to 5 grains as soon as the first indication of an attack is felt.

The citrate of caffeine is not as effective a preparation as pure caffeine, and the popular effervescing preparations of a bromide and citrate of caffeine are not to be relied upon for the effect of caffeine. The best way to employ caffeine is to give a powder of 1 grain at the very onset of the attack, and repeat the dose every quarter of an hour until four or five doses have been taken. These powders are conveniently carried in the pocket and can be taken without the addition of water. We must remember that this drug sometimes produces an excited and tremulous condition of the patient, and occasionally considerable palpitation of the heart.

Aconitine (Duquesnel's) sometimes gives relief after the pain has become severe: $\frac{1}{200}$ grain may be administered every hour until some sense of numbness is felt. It would not be wise to give more than four doses.

Guarana is also of use, and may be given either in powder, the fluid extract, or as an elixir. Its potency depends upon the caffeine which it contains, and therefore it is hardly to be preferred to the pure alkaloid. I have, however, seen excellent results from the administration of 10 grains of powdered guarana with 5 grains of salicylate of sodium every ten or fifteen minutes until three or four doses have been given; and this combination has the advantage of being absolutely harmless, so that a patient may be trusted to take as many

[1] *Pacific Medical Journal*, Jan., 1889.

doses as are necessary to relieve the pain without fear of unpleasant effects.

The bromides answer in some cases, especially where there is considerable hyperæmia, the so-called angio-paretic variety, and I have found the bromide of lithium the most eligible. The bromide of nickel has been recommended by DaCosta, and has been found useful. One of the bromides combined with chloral is occasionally of more value than bromide alone. Croton-chloral sometimes gives relief, and is more especially indicated in the cases in which the branches of the fifth nerve are implicated.

Seguin suggests a hypodermic injection of hyoscyamine, $\frac{1}{50}$ of a grain. The oil of eucalyptus occasionally affords relief in cases of migraine. It should be administered in capsule, 5 minims, and repeated every half hour until four doses have been taken. It is to be given in the intervals between the attacks as well as during the paroxysm.

Salicylate of sodium has been recommended for the relief of headache, but it is liable to produce nausea, and is objectionable on this account. If, however, it is given in the effervescent form, it is less likely to disturb the stomach. A good way to administer it is to give 5 or 10 grains of the salt in a half-tumblerful of water made effervescent by the addition of a dessert-spoonful of the granular citrate of caffeine. This combination is often efficacious, especially when the attack has been induced by exposure to cold.

A number of writers have recommended morphine hypodermically for the relief of the pain, but I believe it should always be avoided if possible. The habit is easily formed, and the patient frequently suffers from the depression and disordered digestion due to the morphine after the attack.

Besides the internal remedies of which I have spoken, there are a number of external applications which have given relief in certain cases, but they are not so reliable as the drugs. The application of heat to the head, or sometimes cold, freezing applications, or a spray of methyl chloride as recommended by Jacoby affords relief.

Sinapisms or other counter-irritants are relied upon by some patients, and the menthol preparations, either the solution of the crystals in alcohol or a menthol cone, have for some time enjoyed a reputation for the relief of headache.

The bisulphide of carbon as an irritant has been recommended. Its odor, however, is objectionable, but this can be masked to some extent by essence of peppermint. In some cases in which the pain begins in the forehead an application of a 2 per cent. solution of oleate of aconitine at the very onset will check the attack.

Galvanism is sometimes found of use during the paroxysm, but the faradic current is stated by Gowers to aggravate the pain.

For the preventive treatment the prolonged use of galvanism is, I think, undoubtedly of value. It should be very carefully applied to the head, and the applications should be of short duration—not more than four or five minutes at each time.

The question often arises whether it is better for a patient to keep up during an attack and try to attend to his business or various duties, or whether he should give up at once and retire to his room. My own experience is that, where it is possible so to do, it is far better for a patient to give up at once, take the suitable remedies, and lie down for an hour or two. In this way an attack will often be aborted, and the wear and tear on the whole nervous system by a severe paroxysm is thus saved.

The most efficient remedies are seldom of value in migraine unless they are taken at a time when a patient can get quiet and repose. When it is possible the best way to shorten a paroxysm is to administer a full dose of the drug which is indicated, and let the patient lie down in a darkened room, with hot applications to the head as well as to the feet. A writer in the *Medical Record*[1] says that headache almost always yields to the simultaneous application of hot water to the feet and head.

When antipyrine, phenacetin, or acetanilid is given, it is particularly important that the patient should lie down for at least half an hour after the administration of the remedy. If the patient is obliged to keep up during the paroxysm, it is better to give remedies like caffeine, guarana, or one of the bromides.

Headaches of Childhood.

Children are more subject to headaches than is generally realized, and the attacks may begin at an early age. I have seen children two years of age with every evidence of migraine. Children are usually uncomplaining about pain in the head, and if they do speak of it are likely to continue their play as if they had forgotten it. The pain, however, may be quite severe. Before a child is able to talk evidences of pain in the head are shown by irritability, crying or fretting, the expression of the face, and objection to light.

The varieties of headache in children most commonly met with are migraine, anæmic and organic headaches, and the reflex headaches, such as those from eye-strain, nose and ear disease, and genital irritation. Ollivier[2] does not believe that any special type of headache can be regarded as due to the period of growth. Careful examination will generally show that the headaches are the result of ocular defects,

[1] July, 1891.

[2] *Medical Age*, Dec. 28, 1889.

inanition, hysteria, or some other definite cause, rather than to growth alone.

Allan McLane Hamilton[1] remarks that "neuralgic pain is rare in infancy, or at least until after the fifth year, when headaches of the migrainous type are found commonly among overworked school-children or as the sequelæ to some malarial or typhoidal fever. Trigeminal neuralgia is more common in girls, and is often associated with eczema. It is safe to assume, however, that severe head-pain in young children is an alarming symptom, especially if the pulse is irregular and feeble. The headache is usually general or may be confined to the frontal region. Intense headache, with associated photophobia, sensory hyperæsthesia, and constipation, is as a rule highly characteristic of meningitis. The variety of headache of the lighter grade which appears in children after the third or fourth year is to all intents and purposes a hemicrania. It is developed by fatigue or undue strain at a time when the brain is attaining its early development, and is aggravated by errors in diet and management. It is associated with gastric irritation, nausea, and loss of appetite, and usually begins in the morning. In many respects it resembles the ordinary sick headache of the adult."

Migraine in children can usually be traced to direct hereditary transmission, or there may be only a neurotic history. It may be handed down through several generations, although occasionally it is absent in one generation and reappears in the next. In large families we often see several members who have immunity from this affection notwithstanding a marked hereditary tendency. Hereditary transmission is said by Seguin[2] to be more frequent and marked through the mother to the female children.

The character of the attacks which children have is often similar to those of the parents, presenting the same ocular phenomena, such as hemianopsia, scotomata, and dimness of vision. The character of the attacks also is likely to continue the same after adult age.

Eye-strain is a frequent cause of migraine in children, and the fact of the paroxysms frequently commencing at the age of seven or eight, the time when a child usually begins to attend school, points to the connection between defective eyesight and the headaches.

We may also note that migraine may be due to nasal irritation and obstruction, as has been previously mentioned. Children who have chorea often suffer from attacks of migraine, and it is also often found in cases of chorea that there has been a previous history of headaches.

Frequently the attack begins with some ocular phenomena, although as a rule this is not noticed by the child unless he is several years old. Usually on awaking, or soon after, there is a deep-seated pain in one

[1] *Cyclopædia of the Diseases of Children*, Keating, vol. iv. p. 450.
[2] *Ibid.*, vol. iv. p. 820.

side of the head. This increases in severity, and is accompanied by dulness, coldness of the extremities, and flushing or pallor of the face. After a time there are nausea and vomiting, and if the patient falls asleep after vomiting he will usually awaken free from pain.

The attacks occur with considerable regularity every two to eight weeks, and in girls after the appearance of menstruation the paroxysms are most likely to occur at the catamenial period—not, however, because of any direct influence from this function upon the disease, but because the catamenia is merely an exciting cause of an attack in a person predisposed to it.

We must remember that the nausea and vomiting which are such frequent symptoms of the paroxysm do not depend upon any disorder of digestion or upon the taking of improper food. The nausea is a result of the nervous disturbance, and very frequently the act of vomiting brings from the stomach little but mucus and bile after considerable retching. It is not desirable for a child to take food during an attack, as gastric digestion seems to be to a great extent arrested, and if a meal has been eaten while the pain is severe the contents of the stomach are often vomited unchanged after several hours.

In childhood the attacks are not as long as in adults. They seldom last more than a few hours, and rarely an entire day. As soon as a paroxysm begins it is best to keep the patient quiet in a darkened room and endeavor to induce sleep by the surrounding conditions. If the pain is severe, give small doses of antipyrine, 3 or 4 grains to a child of eight years, combined with caffeine. One or two doses of caffeine may be given at the onset in cases accompanied by ocular prodromes, and guarana in the form of powder or fluid extract is sometimes effective. Use external means also, applying an ice-bag to the head if it is hot, and hot water to the feet. Menthol or aconitine may be applied to the forehead should the pain be frontal. Massage of the scalp is sometimes very soothing to children, often enabling them to fall asleep without the aid of any other remedy.

In children the treatment between the paroxysms consists largely in attention to the general health in the first place, correcting any ocular defects and relieving any catarrhal or obstructive conditions of the nose. It is important to remove any sources of genital irritation, such as contracted prepuce or adherent clitoris.

Cannabis indica, combined with iron and arsenic, should be given for long periods, but the principal point is to make the hygienic conditions of the child as good as possible. We should insist upon plenty of out-door exercise, gymnastics, daily bathing and friction of the skin, and regular early hours for going to bed and rising. The condition of the school-room as to light, ventilation, and the desk at which the child sits are of the utmost importance. Many cases of

migraine are very much aggravated in children, if not originated, by the poor light and imperfect ventilation of the school-room; and we should remember that the establishing of migraine in childhood means the persistence of the attacks throughout life.

Moncorvo[1] has lately employed exalgin (methyl-acetanilid) in the treatment of infantile neuralgia and migraine. His statement is to the effect that he has definitely seen migraine and neuralgias, which had been of long duration and had resisted other therapeutic agents, disappear under the administration of exalgin. One case may be cited somewhat in detail: On the 26th of August, Moncorvo admitted into his service a little negro of eleven years, thin, rachitic, presenting the manifestations of malaria, and having the liver and spleen engorged. The family history was tubercular and neurotic. For several weeks this little boy had suffered from attacks of migraine on the right side, accompanied by photophobia on the same side. These attacks often lasted more than a day, and obliged him to give up everything. During the first two days after his admission calomel, benzoate of sodium, and quinine were administered in order to disgorge the liver and spleen. Notwithstanding this, a new attack of migraine came on on the 28th, which caused him to prescribe exalgin in the dose of 20 centigrammes (3 grains), to be taken in three doses in the twenty-four hours. The next day he was notably improved, having been able to sleep the preceding night. The exalgin was continued for two days, and after 60 centigrammes (9 grains) had been taken there was a total disappearance of the attacks of migraine.

The writer considers that exalgin surpasses in activity antipyrine, and it is to be preferred to this analgesic in infantile therapeutics on account of the smallness of the dose and the freedom from after-effects.

Lithæmia may exist in children as well as in adults, and we should treat this by abundance of exercise, care in diet, and alkaline waters. Starchy and saccharine food should be avoided by those who show any tendency to lithæmia, such as brickdust deposit in the urine, coated tongue, and heavy breath. The habit of giving children an excess of starchy food combined with sugar tends to produce lithæmia. It is very common to find that children, even up to twelve or fourteen years of age, habitually make a breakfast consisting almost entirely of oatmeal or some porridge with cream and large quantities of sugar, to which is added some griddle-cakes and syrup.

Many children who suffer from attacks of migraine are pale and badly nourished. Cod-liver oil is of the utmost value in these cases, especially when alternated with iron and arsenic. These cases are

[1] *Bulletin général de Théapeutique*, May 30, 1891.

often deficient in fat, and the addition of fatty substances to the diet is always of value to them, provided that they can be assimilated.

Day mentions school headaches in children, and expresses the opinion that they are generally hyperæmic. He speaks of the flushed face and dull, heavy expression of these children. However, they may be anæmic or asthenopic. They are usually accompanied by a sense of fatigue in the eyeballs and forehead, and occur after the school-hour. As is the case with migraine, they frequently depend upon refractive errors of the eye, and are usually relieved by proper glasses.

We should remember that the eyes of children may change considerably within a year or two. In a patient recently under my care the degree of astigmatism changed so much in two years that complete change of glasses has been necessary.

Children may also have headaches from digestive disturbance : those who eat too much or too rapidly are subject to them, the attack coming on from one to three hours after a meal.

Jules Simon[1] makes seven different groups of headaches in children. Among them are the headaches of growth. They are frontal, increased by work, and coincident with pains of the joints, periosteum, and cardiac hypertrophy.

Children may have headaches due to anæmia. The general appearance of the child is frail, pallid, and chlorotic. The headache is dull and constant, and is increased by exercise.

The indications are to improve the general health by care in diet and the administration of iron and arsenic, removing the child from school, and giving him plenty of exercise in the fresh air. In these cases massage is of value.

There are also headaches in children due to a variety of other causes. For instance, in disease of the heart mitral insufficiency may be a cause of constant, dull, heavy headache. Disease of the ear, accumulation of wax, or the presence of foreign bodies may give rise to headache. Enlarged tonsils, as I have remarked elsewhere, is a frequently unrecognized source of headaches in children. I have often seen persistent headaches caused by hypertrophied tonsils, and associated with the headaches not only great irritability of temper, but dulness of intellect. After the removal of the tonsils, either by excision or treatment by galvano-cautery, the greatest change takes place in the intelligence, growth, and morale of the child. Sometimes it is the presence of the adenoid growths in the pharynx, the so-called pharyngeal tonsils, which gives rise to the obstruction and headache. These are readily removed.

Children may have malarial headaches, which are manifested as a

[1] *Medical and Surgical Reporter*, July 11, 1891, from *Revue des Maladies de l'Enfance*, May, 1891.

dull frontal pain, and they are usually accompanied by febrile symptoms. Sometimes the attacks present a distinct periodicity.

Genital irritation is sometimes a cause of constant headache or head-discomfort in children. Seguin[1] says that one of the worst cases of occipital headache he ever saw in a child was cured by circumcision.

In organic cerebral disease pain is a constant symptom. The pain of meningitis, especially that of the tubercular variety, is well known, and occasionally we meet with syphilitic headaches in children. In this form there is usually exacerbation of the pain at night. The pain of organic cerebral disease in children is usually sharp and intense, causing the child to cry out or complain loudly. When it is due to meningitis or tumor in the cerebellum, it is usually located in the occiput, and there is associated with it rigidity of the neck-muscles.

In almost all cases of headaches in children, not organic, when we do not find any reflex causes there will generally exist some defect in the nutrition or hygienic surroundings of the patient.

General tonic treatment and correction of dietary errors will be found more useful than any special drugs that can be given. When palliatives are necessary, antipyrine or the bromides may be administered. Chloral is occasionally necessary, and in organic headaches we are sometimes obliged to administer morphine, but it is very important to avoid, as far as possible, the use of this drug. In cases of migraine or reflex headaches the relief afforded by an opiate is seldom complete, and the recovery from the attack is not as good as when opium has not been used. Moreover, as we have already stated, the liability to form the morphine habit is a danger that we should invariably bear in mind. It is true that a number of good authorities recommend and justify the use of morphine, hypodermically and by the mouth, in different varieties of headache, but I am more and more convinced of the danger of using it.

Constant Chronic Headache.

We frequently meet with patients who tell us that they suffer continually from headaches which are more or less severe. These headaches may be due to various causes, and may belong to one of the different varieties previously described. I believe, however, that when a person has persistent headache sufficiently severe to be constantly recognized, it is often due to meningitis or, at any rate, to meningeal irritation.

Patients speak of having two or more headaches of different forms; for example, one may have a constant headache, and in addition attacks of migraine or of rheumatic headaches. These constant headaches are

[1] *Op. cit.*

usually dull in character, and may be either frontal or occipital, but are most frequently the latter; for example, the occipital ache which sometimes replaces migraine after forty-five or fifty years of age. There are occasionally exacerbations of pain, and sometimes the pain becomes less, amounting at times to merely a sense of discomfort. This form of headache is seldom due to eye-strain, for I have seen cases in which errors of refraction have been properly corrected without relief of the headache. The following case is a good example of constant chronic headache:

H. I——, forty-three years of age, a well-educated and intelligent man, began to suffer with headaches at about the age of twenty. He has never since that time been free from some sense of discomfort in his head, and the greater part of the time there is marked pain. The pain is usually frontal or occipital, but most of the time is occipital, and sometimes it extends down the spine as far as the waist. He sleeps fairly well, but awakens in the morning with severe pain in his head. His general health is fairly good; he has a good appetite, good digestion, and is able to take a moderate amount of exercise. Mental operations, such as study or even writing a note, will make the head-pain worse. He thinks that he is naturally of a cheerful disposition, but since having this continuous head-pain he is despondent and has a sense of some impending misfortune; he feels as if a fate were hanging over him. He describes a variety of singular head-sensations, and speaks of "a kind of quivering inside of his head," which he likens to a rock which has fallen and is balanced on the edge of a precipice. His eyes have been carefully examined and are practically normal.

Dr. Mitchell has written an interesting and instructive lecture on "permanent headache."[1] He refers to a clergyman who for "eleven years had headache which was sufficient to give his face an expression of suffering, and yet during all this time wrote sermons of unquestionable ability and attended to the wants of a considerable parish." He thinks that very frequently those cases of permanent headaches which, although originally due to eye-strain, have been unrelieved by proper glasses, are the result of injury to the brain-tissues from too protracted strain. He has often met with constant headaches the result of asthenic conditions, and has cured these by the rest treatment.

He also refers to two cases of permanent headache which were associated with asthma. He speaks of the headaches of hysteria, which he says are often permanent. In most of these cases of permanent headaches Dr. Mitchell thinks that to raise the health level is a means of enabling drugs to act more favorably.

The treatment of constant chronic headaches by any means is at the best unsatisfactory, although we are often rewarded for a careful study

[1] *International Clinics*, October, 1891.

of the case by finding some condition which we may relieve by treatment. For instance, they may be the result of some ocular defect, a gouty habit, or some error in the mode of life.

In cases of persistent constant occipital headache which, I believe, are often due to a low grade of meningitis, we will frequently find relief from the long-continued use of minute doses of the bichloride of mercury and counter-irritation by means of Paquelin's cautery to the back of the neck. Change of climate and travel, and especially visits to watering-places where baths and the "movement cure" are employed, will prove of decided advantage, and will sometimes accomplish the cure of cases which have resisted all treatment at home. Keen and others have trephined the skull for persistent headaches which have not yielded to other remedies. Good results have followed the operation even when no evidences of pressure have been found.

NEURALGIA.

The treatment of neuralgia is practically the same in different parts of the body, and depends more upon the variety of the neuralgia than upon its location.

Neuralgia may be due to actual disease or inflammation of a nerve-trunk—neuritis—or it may exist without any structural change in the nerve. The alterations in the nerve may be simply molecular, and not capable of being demonstrated by any means at our command; but the way in which an idiopathic neuralgia behaves—for instance, its sudden disappearance from one part to reappear in other, or its complete relief after a comparatively short time—confirms the belief that it is not due to organic change in the nerve.

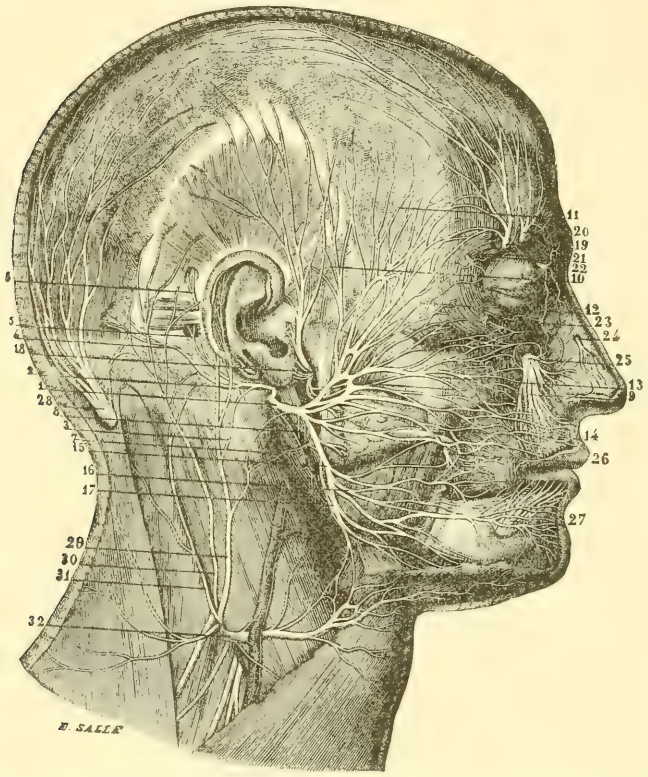
We should then divide neuralgias into two forms: the symptomatic, in which the pain depends upon neuritis or some other structural change in the nerve; and the idiopathic, in which the pain does not depend upon any change that can be detected in the structure of the nerve.

Neuralgia from neuritis may exist in any of the nerves, but it is most frequently met with in the sciatic nerve and in some of the branches of the fifth nerve. The character of the pain differs but little in either the symptomatic or idiopathic variety, but the symptoms accompanying the pain are different. For instance, in neuritis there is much more pain and sensitiveness over the nerve-trunk than in idiopathic neuralgia.

Neuralgia of the Fifth Nerve.

The fifth nerve is probably more frequently affected than any nerve in the body, and the varieties of neuralgia of the fifth are numerous. When we consider the number of branches of this nerve, its exposed situation, and its important functions, it is not remarkable that such is the case.

Fig. 30.



Superficial Branches of the Facial and the Fifth: 1, Trunk of the facial; 2, Posterior auricular nerve; 3, Branch which it receives from the cervical plexus; 4, Occipital branch; 5, 6, Branches to the muscles of the ear; 7, Digastric branches; 8, Branch to the stylo-hyoid muscle; 9, Superior terminal branch; 10, Temporal branches; 11, Frontal branches; 12, Branches to the orbicularis palpebrarum; 13, Nasal or suborbital branches; 14, Buccal branches; 15, Inferior terminal branch; 16, Mental branches; 17, Cervical branches; 18, Superficial temporal nerve (branch of the fifth); 19, 20, Frontal nerve (branches of the fifth); 21, 22, 23, 24, 25, 26, 27, Branches of the fifth; 28, 29, 30, 31, 32, Branches of the cervical nerves (*Hirschfeld*).

One branch alone may be involved or all of the branches at the same time. The supraorbital is most frequently affected, and it is in this nerve that some of the headaches seem to begin. The attacks of brow-ague which have already been alluded to are located in this nerve. The pain is felt most markedly in the supraorbital notch, and

extends over the forehead and as far back as the parietal bone. In supraorbital neuralgia there are certain tender points to be discovered. One is just above the notch, one in the outer part of the upper eyelid, one at the emergence of the nasal branch, and sometimes one apparently in the eyeball. There is often a point at which the pain is intense in the parietal bone about three inches above the ear. This point corresponds to the termination of some of the branches. Pain in this nerve is frequently the result of exposure to cold, but it may be due to other causes. Occasionally intense pain is felt in the supraorbital nerve after taking a very cold substance, like ice-cream, into the stomach, and it may also be secondary to inflammation of the lining of the frontal sinus.

Infraorbital neuralgia is generally associated with neuralgia in one of the other branches of the fifth, but occasionally it is felt alone. Most frequently pain is felt at the emergence of the nerve from the foramen. Pain in the inferior dental nerves is frequently associated with caries of the teeth, but it may be due to exposure to cold or to rheumatic or other influences.

Neuralgia of this nerve comes on usually after middle age, and in old persons is very difficult to cure. The suffering is most intense, and life becomes unbearable from the violence and persistence of the pain. Tic-douloureux or prosopalgia is the variety in which, associated with the attacks of pain, are convulsive twitchings of the muscles of the face. Trousseau has given the name "epileptiform neuralgia" to a form in which the pain comes on suddenly with great violence and lasts only a minute or two. The frequency of the attacks varies in different cases, but they may recur every few minutes during the entire day, and the excruciating agony suffered by the patient can hardly be described.

Putnam has added some valuable facts to the pathology and treatment of neuralgias of the fifth pair. He speaks[1] of the relationship between migraine and supraorbital neuralgia—a connection which was also recognized by Anstie—and he believes that this is confirmed by the fact that persons who suffer from migraine are sometimes liable to have attacks of supraorbital and occipital neuralgia. Dr. Putnam states further that he has examined nerves which had been removed from eight patients who had been operated upon for trigeminal neuralgia. More or less marked changes were made out in all but three of these nerves. The slighter changes consisted in an infiltration of small nerve-cells in the nerve-sheath around the vessels and amongst the nerve-fibres themselves, especially in the neighborhood of the sheath. He also found in some of the nerves degenerated changes in the axis-cylinder and nerve-tubes.

[1] *Boston Medical and Surgical Journal*, Aug. 13 and 20, 1891.

Various views have been advanced as to the pathology of trigeminal neuralgia. Dr. C. L. Dana [1] considers that the condition depends upon an obliterating arteritis of the nutritive vessels of the nerve. The reasons given are that the disease occurs at an age when degenerative changes begin in the arteries and follow a certain fixed vascular distribution. In an examination of various specimens of the superior maxillary nerve removed from typical cases of tic-douloureux there was no noteworthy change of the nerves found, while in three specimens there was striking evidence in vascular disease. The therapeutic evidence deduced from the favorable action of aconite, which lowers tension, is given as favoring this view. As the removal of the peripheral nerve may effect a cure, it is considered that the neuralgia is the result of some local peripheral irritation.

Quenan and Lipais are quoted as finding the existence of a closer and more extensive relationship between the blood-vessels and the nerve-trunk than has usually been supposed.

We must bear in mind that these nerves which have been examined by Putnam, Dana, and others were from cases in which there were evidences of neuritis, and in which the nerve to the naked eye probably showed evidences of inflammatory changes. Several cases have been described in which the inferior dental nerve has been excised and found swollen and red. For instance, Tuffier reported a case of neuralgia of the lower jaw in which the nerve was found swollen and reddened both within the dental canal and before its entrance.

I have recently seen an interesting case of neuralgia of the inferior dental in which neuritis was distinctly shown by the extreme hyperæsthesia in the distribution of this nerve. The patient, a woman of forty-six years, had suffered for three or four weeks from neuralgia in the lower jaw. One or two suspected teeth were extracted without relief, and galvanism was resorted to for the pain. After the application of a strong current, in which a reversal of the poles was made, she experienced a hyperæsthesia in the skin over the lower jaw. When I saw her she was suffering but little acute pain in the nerve, but there was exquisite hyperæsthesia confined accurately to the skin-distribution of the inferior dental nerve, ceasing exactly at the median line of the chin and extending to the margin of the lip.

S. Ehrmann [2] has collected some cases, which he published in the *Neurologisches Centralblatt*, in regard to the production of severe trigeminal neuralgia following the administration of even small doses of potassium iodide. Fifteen grains produced in a strong man, aged thirty-five years, most intense pain in the forehead and in the teeth, with sensitiveness over the area of distribution of the fifth nerve. It was associated with lachrymation and injection of the conjunctiva.

[1] *Medical News*, May 26, 1891.

[2] *Lancet*, May 2, 1891.

These symptoms disappeared, only to be followed by their reappearance when the drug was again administered. Three other cases of a similar nature are also cited.

The treatment of neuralgia of the fifth nerve is more or less successful, depending upon the age and general condition of the patient. However, it should be regarded generally as a most intractable disease, and the long list of remedies which is to be found is evidence of the difficulty of curing it.

In many cases of trigeminal neuralgia treatment directed to the general health is capable of relieving the pain. Iron and arsenic have been found useful remedies, the precipitated subcarbonate of iron in large doses being especially valuable. Gelsemium is a remedy of distinct potency in the treatment of these cases, and it is particularly adapted to those forms which depend upon dental caries. I have found, however, that it is useful in the treatment of neuralgia of all the branches of the fifth. The fluid extract is the best preparation, and as the strength of this preparation is variable, it is best to begin with a small dose and gradually increase it until the toxic effects are felt. It is well to keep a patient under the influence of the drug for some days—just on the verge of the extreme dose, so that a slight dizziness or dimness of vision is felt for a time after taking a dose of the remedy.

Cannabis indica is also a useful remedy, and should always be given in full doses, pushing it up to the point of tolerance.

Phosphorus has been recommended by Thompson in large doses, but most other observers have failed to find it of great efficacy, and, moreover, it is very irritating to the stomach; however, there are cases in which it is useful. Gowers, for instance, describes a case of a woman of forty-three years, with neuralgia of the fifth nerve of thirteen months' duration, who was entirely relieved after three months' treatment with phosphorus.

Phosphide of zinc may also be given. Belladonna has been recommended, but it very seldom gives marked relief. Aconitine is strongly recommended by some writers, among them Seguin. It is undoubtedly a remedy of value, although it must be given with caution. Duquesnel's aconitine should be used in doses of from $\frac{1}{250}$ to $\frac{1}{100}$ grain, and it should be pushed until slight tingling and numbness are felt in the face or lips.

Cimicifuga—*Actea racemosa*—has been recommended in those forms connected with rheumatism, and it may be given in combination with cannabis indica.

Croton chloral—butyl chloral—has been recommended by many writers, Ringer and others. H. A. Hare[1] has recently written on its

[1] *Medical News*, May, 1889.

use in trigeminal neuralgia. He gives it in doses of 5 grains every two hours, and has found that its influence is curative as well as palliative. Dana has suggested the use of strychnia hypodermically in massive doses.[1] He begins with gr. $\frac{1}{30}$ once a day, and the dose is very slowly increased until by the fifteenth or twentieth day gr. $\frac{1}{6}$ or gr. $\frac{1}{4}$ is given. The effect of these large doses is decidedly anodyne, often quieting the patient for hours like a dose of morphin. This remedy does not succeed in all cases, but I have myself seen the most markedly beneficial results in severe cases. In one case complete relief was afforded a patient who had suffered for months from the most excruciating neuralgia of both fifth nerves.

Sometimes a combination of a nervine and a tonic is of value. Gowers says that he has found the simultaneous administration of arsenic, quinine, and Indian hemp of great service. The prolonged use of cod-liver oil is undoubtedly of great value in many cases. In some forms—as, for instance, in inferior dental neuralgia, in which there is reason to suppose that there is periosteal thickening—the iodide of potassium is indicated; indeed, remarkable results have been obtained from the administration of large doses of this salt in trigeminal neuralgia independent of periostitis or syphilis.

For local applications various remedies have been suggested, and have proved useful in different cases. Counter-irritation is uncertain, and acts merely as a palliative during the severe paroxysms. Menthol in the form of a cone or in alcoholic solution, or oil of peppermint, has often afforded relief.

Aconitine and veratrine in ointment or as an oleate will temporarily dull pain. Bartholow recommends the following:

℞. Veratrinæ, 2 parts;
Acid oleic, 98 parts.—M.
Sig. Oleate of veratrine.

℞. Veratrinæ, 4 parts;
Alcohol, 6 parts;
Adepis benzoinat., 96 parts.—M.
Sig. Veratrine ointment.

Flying blisters over the points of emergence of the nerve are sometimes of lasting benefit, but the actual cautery is of more permanent good, although, for obvious reasons, its application to the face is objectionable. I have seen one patient with excessive pain in the lingual branch of the fifth completely relieved for two years by the application of the actual cautery to the painful point in the side of the tongue.

[1] *Transactions Association of Amer. Physicians*, vol. xi. p. 383.

Cocaine, injected hypodermically in the course of the nerve, has afforded temporary ease from pain, but it is an unsafe remedy.

Camphor chloral—that is, a solution made by rubbing together equal parts of camphor and chloral, which liquefies—is often very beneficial; it may be applied on lint and covered with oil-silk.

Electricity, when judiciously applied, is of great value. The faradic current is not beneficial, and often aggravates the pain, but the galvanic current is of decided potency in many cases. The direction of the current is a point to be considered, and much discussion has taken place as to which pole should be placed over the seat of pain. Gowers thinks that the direction of the current is of but little importance. My own experience is that the negative pole should be placed over the painful point and a mild current passed for two or three minutes. A well-wetted sponge should cover the electrode. This should be placed over the painful nerve and the other pole at some indifferent point. After the electrode is in contact with the skin, the current should be gradually turned on, and the strength should be 2 or 3 milliampères. Before removing the electrode the strength of the current should be reduced. Any sudden change in the force of the current is to be carefully avoided, and reversing the current is a most dangerous procedure. The application should last for two or three minutes, not longer than five minutes, and it should be used daily, and sometimes, when convenient to do so, it is well to make two or three short applications each day.

Static electricity has proved effective in some cases in which galvanism has failed; it is used by drawing sparks from the painful region with the negative pole.

Antipyrine sometimes is effective in facial neuralgia, and salicylate of sodium or salol is beneficial, especially where there is a rheumatic complication. Dercum has reported some cases of relief of extreme neuralgia of the fifth by large doses of salicylate of sodium.

Fraenkel[1] reports a new plan of treating trigeminal neuralgia. He gives a hypodermic injection of cocaine in the affected place, and then applies a strong current of faradic electricity, placing one pole at the foramen of exit and the other half an inch distant.

Leslie[2] reports sudden and immediate cure of many cases of facial neuralgia from the application of powdered salt to the nasal mucous membrane.

In many cases of facial neuralgia, especially in old persons, all medicinal means fail to afford relief, and we are then compelled to resort to surgical interference.

The results of excision of the nerve are more or less satisfactory.

[1] *Medical Bulletin*, Mar. 15, 1890.

[2] *Edinburgh Medical Journal*, Jan., 1890.

In all cases there is relief for a longer or a shorter time, but generally there is return of the neuralgia.

Nerve-stretching has given relief for the time, and simple section of the nerve is often succeeded by immunity from pain for several months. It is best, however, to excise as large a portion of the nerve as possible, and the nearer the ganglion the nerve is cut the better.

Edmund Andrews[1] having removed a portion of the inferior division of the trigeminal nerve, the patient returned in a year and a half complaining of great pain and asking for a second operation. The old cicatrix was incised, and, catching hold of the nerve as deep down as he could, he forcibly drew upon it and twisted it until it came away. While no nervous tissue was discovered in the part which was removed, the nerve-stretching and the removal of the stump from the cicatricial tissue gave relief to the patient.[2]

In the past few years brilliant success has followed the removal of the Gasserian ganglion in the hands of Rose, Tiffany, Keen, and others. The technique of the operation may be found in works on surgery, and a brief but excellent description of it is given in the *Text-book of Nervous Diseases by American Authors* in the chapter on "Surgery of the Brain," by W. W. Keen. In some of Keen's cases there has been no return of pain four years after the operation. The degree of success seems to depend upon the completeness of the removal of the ganglion. Although the operation is a formidable one and the mortality is high, being from 15 to 20 per cent., nevertheless it is justifiable in cases in which other means have failed.

Ledentu[3] has relieved a neuralgia of the lingual nerve of five years' standing by stretching the lingual nerve. Other instances of relief of neuralgia by nerve-stretching have been reported, but the operation has not proved a satisfactory one, as the relief is generally of short duration, and sometimes a serious neuritis is set up.

When surgical interference becomes necessary, excision of the nerve is by far the most satisfactory means, and the trunk of the nerve should be divided as near as possible to its exit from the foramen. In some cases it is desirable to remove the nerve even farther back than the foramen by drilling through the bone. Vandeveer[4] has reported two cases of relief of infraorbital neuralgia by removal of the ganglion of Meckel. The operation is described at length by him. Putnam[5] recommends operative interference in severe cases without waiting to try the effects of remedies, as he considers the results of excision satisfactory when properly performed; that is, when a large portion of the nerve has been excised. The results of the opera-

[1] Quoted in *Lancet*, Mar. 7, 1891. [2] *Medical News*, Feb. 14, 1891.
[3] *Medical Treatment of Headaches*, by Allen McLane Hamilton, M. D., 1886.
[4] *Medical Record*, New York, June 9, 1883. [5] *Op. cit.*

tion, however, are not sufficiently permanent to resort to excision without having first exhausted all medicinal means at our command. Besides, we must not forget that there are sometimes cases which seem to be cured spontaneously, and there are several cases on record in which strong mental impression permanently relieved severe neuralgias of the face. Le Fort[1] mentions a case of obstinate lingual neuralgia which ceased during the siege of Paris and returned afterward. Putnam quotes the case of Sir John Lawrence, who had suffered excessively from facial neuralgia, and when the news of the Indian mutiny was brought to him the neuralgia at once disappeared, not to return.

I have seen a case of severe tic-douloureux in a woman of seventy-five years, in which the paroxysms were frequent and most violent, associated with excessive hyperæsthesia of the face, so that the patient was unable to use her handkerchief, become comparatively comfortable under the use of gelsemium and tonic treatment. The patient is now easy as regards pain, and seldom has any attacks of sufficient severity to annoy her.

Notwithstanding the fact that in many cases the relief from excision is not permanent, one must realize the intense agony which is endured without cessation for months, and even years, by the victims of facial neuralgia, and be prepared to resort to extreme measures should the case not yield to simpler remedies.

The operation of excision is not a grave one, and we can always promise relief for two or three years, and perhaps longer, and in those cases in which resection of the nerve has been done as far back as the foramen rotundum and foramen ovale the relief is likely to last for a much longer period.

The carotid artery has been ligated for facial neuralgia, but without very satisfactory results.

The use of Jacoby's methyl-chloride spray has been followed with more or less success. The spray should be applied over the painful points until the skin is frozen. The immediate result of the freezing of the part is anæsthesia. This is followed by hyperæmia and increased tenderness, which subsides after a time with the disappearance of the pain.

Frederick Peterson has made some interesting communications on the diffusion of remedies through the skin by means of galvanism. He refers to the fact that Dr. B. W. Richardson as long ago as 1859 produced local anæsthesia with solutions of morphine, aconite, and chloroform by means of the galvanic current. Peterson has made a number of experiments with different alkaloids, and has found that by using a solution of certain drugs at the positive pole the local effects

[1] Gowers, *Diseases of the Nervous System*, p. 1165.

of the remedy may be obtained. For instance, a 10 to 20 per cent. solution of cocaine on the anode will give relief from severe neuralgia for from four to eleven hours without constitutional effects. He relates two cases of severe chronic supraorbital neuralgia and one of inferior maxillary neuralgia which he relieved for several hours by the anodal diffusion of a solution of cocaine and aconitine. Several other writers have had similar success.

The remedies which Peterson has used are helleborin, cocaine, atropine, ouabain, strophanthin, aconitine, and chloroform. He employs an electrode made of metal and nickel-plated, with a rubber rim, places upon the metal surface a piece of tissue or filter paper or linen, drops upon it the solution of the drug to be used, and applies it to the skin. The strength of the current employed by him is from 5 to 20 milliampères, and may be used for from five to fifteen minutes according to the strength of the current, or, he says, "if one has no galvanometer he may use from ten to thirty or more cells of a Grenet, Lélanché, or chloride-of-silver battery." This seems rather a strong current to be applied to the face.

Sciatic Neuralgia.

Sciatic neuralgia is another form which we have to treat frequently, and it often taxes the patience of both physician and patient. The treatment of this disease depends to some extent upon whether we have to deal with a neuritis or a functional neuralgia. Neuritis is the most common cause of sciatic neuralgia, and it may depend upon gout and rheumatism. There are some cases in which simple muscular over-exertion will produce it, and it may also be caused by exostoses or tumors pressing upon the nerve in its course. It is much more frequent in males than in females, and generally occurs after the age of forty years. The older a patient the less prospect of relief. The cause of sciatic neuritis is not always to be discovered, but in a number of patients it can be traced to exposure to cold and wet, sitting on a cold stone, or exposure to draughts while the clothing is wet. Occasionally it can be traced to sitting on a hard seat for some time. Associated with it may be tenderness along the nerve-trunk, and sometimes hyperæsthesia in the distribution of the nerve; numbness and tingling and patches of anæsthesia on the back of the thigh and calf are sometimes met with. In cases of long standing the muscles of the leg become flabby, weak, and atrophied. This is most noticeable in the muscles of the calf.

In a case of acute sciatica the pain is sometimes very severe from the onset, or it may come on gradually, growing more and more severe.

The distinction between a neuritis of the sciatic nerve and a simple

neuralgia is not always easy to make. As a rule, however, there is more tenderness over the nerve in neuritis, and more sensory disturbances in the distribution of the nerve, than in sciatic neuralgia. Sciatic neuralgia is more likely to occur in patients who are weak and anæmic, and it may also be a symptom of locomotor ataxia. There is no doubt that in many cases of confirmed and intractable sciatica the disease is located in the spinal cord, and the pain in the sciatic nerve is merely a referred symptom.

In many cases there is a periodicity in the paroxysms of pain in the nerve, and an evening exacerbation is common. The nights of patients suffering from this disease are distressingly painful, the severity of the pain often causing them to lie awake the greater part of the time. The sitting position often aggravates the pain, partly on account of the pressure of the nerve at the notch, and partly on account of the stretching of the nerve by flexing the leg. Patients often find themselves more comfortable when standing or walking about the room than when lying still, although after walking or standing for a while the pain is aggravated.

In the treatment of sciatica, whether of the inflammatory or idiopathic type, rest is essential, and there is no class of patients more difficult to convince of the necessity for absolute rest, because of the fact that walking about the room often affords temporary relief. In acute sciatica it is best to place the patient in bed and enjoin him to keep the leg extended and as quiet as possible.

Counter-irritation is of great importance from the very onset, and an attack may be aborted by the prompt application of blisters over the seat of pain. Dry cups over the course of the nerve are useful. If the pain is intense, a hypodermic injection of morphine combined with atropine will relieve it temporarily and sometimes permanently. Cocaine has been recommended for its anæsthetic properties, but must be injected deeply and near the nerve-trunk itself to give relief. It is objectionable on account of the toxic effects which sometimes follow its use. Occasionally, acute cases of sciatica are relieved by the administration of antipyrine and bicarbonate of sodium, and full doses of salicylate of sodium or salol will sometimes also arrest the attack.

The bowels should always be thoroughly unloaded, as a distended rectum may cause the trouble by pressure upon the nerve. Various sedative liniments and ointments have been used over the course of the nerve with greater or less relief. The menthol cone has been successful in many cases, and an ointment of aconitine or veratrine is sometimes of benefit, but the applications to the skin are seldom efficacious, owing to the depth at which the nerve is located.

In gouty cases the antilithæmic remedies should be used and careful diet insisted upon. Colchicum is a valuable remedy in gouty cases.

The following prescription is recommended by Dr. J. T. Metcalf:[1]

℞. Tinct. aconiti rad.,
Tinct. colchici sem.,
Tinct. belladonnæ, āā. fʒij.—M.
Sig. Six drops every six hours until relieved.

Brown-Séquard recommends the following prescription:

℞. Ext. belladonnæ,	gr. $\frac{1}{6}$;
Ext. stramonii,	gr. $\frac{1}{5}$;
Ext. cannabis indicæ,	gr. $\frac{1}{4}$;
Ext. aconiti,	gr. $\frac{1}{3}$;
Ext. opii,	gr. $\frac{1}{2}$;
Ext. hyoscyami,	gr. $\frac{2}{3}$;
Ext. conii,	gr. j;
Pulv. ext. glycyrrhizæ,	q. s.

M. et ft. pil.

Two, three, four, and even five, of these pills may be given in a day.

Potassium iodide is an invaluable remedy in cases of chronic sciatica, and when a rheumatic or gouty diathesis is present it may be advantageously given with colchicum.

Turpentine has enjoyed a reputation of being curative in inveterate sciatica. It may be given in capsule in doses of 5 minims and upward three or four times a day. Nitroglycerin is sometimes efficacious. It should be given in increasing doses beginning with $\frac{1}{100}$ grain every three or four hours, and the dose should be gradually raised until the physiological effect of the drug is apparent.

In the treatment of sciatic neuralgia, when the pain is not intense, the patient may be allowed to go about, and in these cases galvanism is of decided benefit. The current should be used daily for several weeks or months, and it is important to apply the electrodes directly over the course of the nerve, pressing them down firmly and deeply so as to reach the nerve as nearly as possible.

Chronic sciatica, whether due to neuritis or simple neuralgia, is very stubborn, and sometimes resists all forms of treatment. Systematic and prolonged treatment is necessary for these cases, and we must insist upon strict obedience to all directions given to the patient. In hospitals it is much easier to carry out all the details of treatment.

The first point of importance is to insist upon absolute rest in bed, and many cases are cured by simply placing the patient in bed and applying a long external splint. The old-fashioned Physick-Desault

[1] *Medical Record*, Feb. 19, 1887.

splint is a convenient form. When rest alone does not afford relief, counter-irritation is necessary, and the application of the Paquelin cautery is almost certain to bring more or less relief. The cautery should be applied at the painful points, and also over the sciatic notch, whether there is tenderness at this point or not. One application is seldom sufficient to effect a cure, and it is sometimes necessary to cauterize the limb three or four times.

Weir Mitchell has detailed at length his plan of treating sciatica by rest and cold.[1] "We rest," he says, "the body, even to using the bed-pan, absolutely imprisoning the leg, so as to ensure a nearly motionless rest. We use cold locally as needed, employ tonics and extra diet, general massage as far as available, and later also local massage. It is, as you observe, a modified rest treatment." In order to show the value of rest, he reminds us of the effect of slight movements of the body upon sciatic pain, coughing, laughing, or sneezing being sufficient to excite a paroxysm.

The plan of treatment, as described by Mitchell—and this plan is in general use at the Philadelphia Orthopædic Hospital and Infirmary for Nervous Diseases—is to place the patient absolutely at rest, not allowing him to get out of bed for any purpose whatever. A long external splint is applied extending from the axilla to the heel. It is well padded, and held in position by bandages at several points in the course of the leg. It is best to have it made with a joint at the knee, so that the leg may be slightly flexed, and it is desirable to change the angle each time that the dressing is renewed. After a few days passive movements of the leg are made at the daily change of the splint, so as to avoid stiffness. It is important to support the ankle with a pad or small pillow, so that the heel does not bear the weight of the leg.

In cases of long standing dry cold is used by means of Chapman's ice-bags applied over the course of the nerve, and these are kept on day and night for several days. Instead of the ice-bag, there is sometimes used at the infirmary a tin case which is filled with ice. The upper surface is hollowed out, so as to receive the leg, which rests in it. The temperature is kept at about 59° F., but by adding salt to the ice in the case the temperature can be lowered still more.

The plan of bandaging the limb from the foot to the groin with a thin flannel bandage may be used to advantage with the application of dry cold. The evenly distributed pressure of the bandage diminishes the amount of blood in the leg and in that way lessens the pain in the part.

After two or three weeks of the rest and cold treatment, if a cure has not been effected the Paquelin cautery is applied in the course of the nerve, and gentle massage is used after the healing of the blisters.

[1] *International Clinics*, April, 1891, p. 275.

The massage should be applied with great care, lightly rubbing the surface and stroking the limb in a downward direction. I have seen several cases of sciatica entirely relieved by the application of the long splint alone, without the use of cold or the application of the cautery.

Graeme Hammond[1] also advocates the use of rest, cold, and electricity. He also recommends the long splint from the axilla to the ankle, and cold by means of ice-bags along the course of the nerve. He advises, in addition, galvanism, by applying a large negative electrode over the sole of the foot and a large positive electrode over the gluteal region at the point of exit of the nerve, using as strong a current as the patient can bear.

Dry heat is occasionally of advantage when applied in one of the forms of apparatus for using heat, but this procedure is often disappointing. More benefit is to be derived from the use of wet heat. This may be accomplished by dipping pieces of woollen blanket or linen towels in scalding water, wringing them out until as dry as possible, and then applying them to the painful region. The part to which they are to be applied should be first oiled to prevent blistering. The application of the hot cloths should be made every fifteen or twenty minutes, and then the patient should be wrapped in blankets to promote perspiration. Baruch has had much success in the treatment of sciatica by this method.

Hydrotherapy is often of great value in the treatment of chronic sciatica. This should be used in the form of the Scotch douche. That is an alternate douche from a hose of hot and cold water. The temperature should be from 110° to 115° F. for the hot water and from 70° to 60° F. for the cold, with a pressure of from twenty to twenty-five pounds for from fifty seconds to one minute. After the application to the course of the nerve the patient should be given the fan douche over the entire body of from 70° to 60° F. Following this the patient should be thoroughly dried and light massage for a few minutes should be given before he is dressed.

Acupuncture is sometimes useful in cases of sciatica, and the German plan, known as Baunscheidismus, has enjoyed a reputation abroad for many years. It consists in driving through the skin a number of needles by means of an apparatus, and rubbing into the punctures oil of mustard or some other irritant. I have seen this plan result in benefit on more than one occasion. One patient who had suffered from sciatica for several years, and had obtained no relief from a number of different plans of treatment, was permanently cured by acupuncture. Aquapuncture—that is, the hypodermic injection of water into the seat of pain—is occasionally productive of relief, the relief sometimes

[1] *Journal of Nervous and Mental Diseases*, May, 1890.

lasting for several hours after the injection. The injection should be at the seats of most intense pain. These are usually at the sciatic notch, in the popliteal space, and just above the external malleolus.

A recent writer [1] has found greatly dilated veins in the interior of the sciatic nerves of persons with varicose veins. He has met with 11 cases of sciatica among 67 persons who suffered from varicose veins. He thinks the sciatica in these cases due to the dilated veins of the nerve, and has obtained excellent results by the application of elastic stockings.

The external use of sulphur has been very strongly recommended in sciatica of late years. The treatment consists in enveloping the whole leg in powdered sulphur during the night. Duchesne [2] states that he has seen a permanent cure of a case of sciatica by a single application of sulphur. Cowden [3] relates a case of severe sciatica which was cured by the application of sulphur two nights in succession. McNutt [4] reports the use of sulphur in 17 cases of chronic non-inflammatory sciatica, and in only 6 did it fail to give relief.

McKinn [5] reports a case of chronic sciatica in which hypodermic injections of antipyrine gave great relief. He injected from 15 to 25 grains at a time, inserting only 5 grains at any one place. The skin in the neighborhood of the injection was made anæsthetic for from fifteen to twenty-four hours. The antipyrine was used in these cases dissolved in a little more than its own weight of water. Other writers have also spoken favorably of the use of antipyrine hypodermically in sciatica, and it has been found that the injections were more efficient the nearer they were given to the nerve-trunk.

Dana [6] speaks of the value of menthol internally in some cases of sciatica. He considers it an efficient and cheap substitute for antipyrine. He gives it in doses of from 5 to 20 grains.

Surgical Treatment of Sciatica.—Nerve-stretching may be employed when all other methods have failed. This may be accomplished in two ways: the first is very simple, and is sometimes called the subcutaneous method. It consists in flexing the affected thigh strongly upon the abdomen and then extending the leg as far as possible. This stretches the nerve to a slight extent and often affords much relief. The other method is to cut down upon the nerve and either with a blunt hook or the finger lift it up and stretch it vigorously. With careful antiseptic precautions no harm can follow this procedure, and it is often attended with the most satisfactory results.

[1] *Annual of the Universal Medical Sciences*, 1889, vol. ii., B. 37.
[2] *Journal de Médecine de Paris*, Jan., 1888.
[3] *American Journal of the Medical Sciences*, July, 1888.
[4] *Medical News*, July, 1888.
[5] *N. Y. Medical Journal*, July, 1888.
[6] *Therapeutic Gazette.*

Babinski and Brissaud have made a study of the attitude of patients suffering with sciatica. They describe a "sciatic scoliosis;" that is, a curvature of the spine with the convexity toward the affected side. There is frequently a compensatory curvature of the spine higher up. The leg is often slightly flexed and supported on the toe. This position is due to the effort which the patient makes to keep the weight off the affected leg. In the case described by Babinski the body was inclined toward the healthy side, and the foot of the painful leg was not lifted from the ground.

Guinom and Parmentier[1] describe a form of neuritis localized in the external popliteal nerve, and associated with degenerative atrophy of the muscles supplied by it, as a complication of sciatica. When this variety of neuritis occurs the case is likely to be protracted and a cure is difficult and often impossible.

Other Forms of Neuralgia.

Among the other and less common varieties of neuralgia is cervico-occipital neuralgia. In this the pain is felt in the region supplied by the great occipital nerve, and is most marked in the terminal branches. I have seen two cases of very violent pain in this nerve which closely resembled meningitis. The pain was accompanied by rise of temperature, delirium, and considerable disturbance of general nutrition. When the pain is periodical, quinine is an efficient remedy, and antipyrine or phenacetin is useful in relieving the suffering of the patient.

The application of dry heat, and in severe cases the mild use of the Paquelin cautery over the nerve, are useful.

In cervico-brachial neuralgia the pain is usually felt just below the clavicle, in the arms, and sometimes in the breast. The most frequent painful points are a shoulder point just where the circumflex nerve pierces the deltoid, an axillary point, a point at the elbow where the ulnar nerve passes between the olecranon and epitrochlea, and another point at the lower end of the radius.

Neuralgia in this region is sometimes confounded with muscular rheumatism, but it may be associated with rheumatism of the deltoid. The use of galvanism is advantageous, but sometimes the faradic brush or static electricity is better.

The arm should be kept at absolute rest while the pain continues severe. Sometimes sponging of the entire arm with hot salt water two or three times a day, and keeping it encased in silk or carded wool, will give temporary relief and often effect a cure.

Internally, salicylate of sodium or salol is of advantage, but as a rule local means are more effective than internal remedies. The general health of a patient suffering with a cervico-brachial neuralgia is

[1] *Annual of the Univer. Medical Sciences*, 1890, C. 45.

usually at fault, and iron and cod-liver oil, with quinine and arsenic, will aid materially in the treatment of the case. These cases are sometimes very intractable, and result in wasting of the shoulder- and arm-muscles. The judicious use of massage will prevent atrophy and stiffness of the joints.

Intercostal neuralgia frequently simulates pleurisy, being sometimes accompanied by shortness of breath and pain on respiration. It is associated at times with an herpetic eruption in the course of the nerve-filaments, producing the so-called "shingles" or herpes zoster. The pain in herpes zoster sometimes precedes the eruption, but frequently it does not appear until after the vesicles are well formed.

Antipyrine and phenacetin are very useful in this form of neuralgia. An ointment containing cocaine or morphine will allay the burning pain when applied to the herpetic irritation. The application of a 1 per cent. solution of cocaine in unguentum petrolatum is said to be an infallible and rapid cure of zoster.

Menard [1] considers that the cause should first be removed, and that counter-irritation should then be excited over the painful spot by means of a blister or iodine; or hot and cold douches should be applied. If anæmia exist, a course of baths with the internal administration of iron should be ordered. If due to rheumatism, the proper medicine for that disease should be administered. Venesection, he asserts, however, in the majority of cases gives excellent results. Another favorite mode of treatment is to apply iodine ointment directly to the walls of the chest, the clothing being protected by means of adhesive plasters.

Coccygodynia is a painful and obstinate neuralgic affection of the coccyx. It results from injury to the bone, either from a fall or blow, or is a result of labor. It may also occur without any direct injury. The pain is sometimes most severely felt when the patient is sitting, but in other cases it is most severe when rising from the sitting position, the pain being probably due to the action of the muscles attached to the coccyx.

A number of plans of treatment have been suggested for this painful malady—one being division, subcutaneously, of all of the tissues connected with the coccyx, and another being extirpation of the bone itself. I have known one case of severe coccygodynia which was cured by the patient sitting only on a chair which had a large hole in the seat.

Plantar neuralgia, or podalgia, is a rather rare affection; but it is occasionally met with, and may be associated with certain vaso-motor disturbances. Weir Mitchell first described this form of neuralgia plantaris, giving it the name of erythromelalgia, and a

[1] *Medical News*, Mar. 7, 1891.

number of other writers have treated of the affection. Recently Sachs has written an interesting paper on the pathology of the disease.

The pain usually begins in the ball of the great toe or the heel, often extends over a great part of the sole, and may reach the dorsum of the foot and the leg. It is felt at first toward night, and is relieved by the night's rest. It is increased by walking, the erect posture, or even by allowing the foot to hang down. The pain is at first of an aching character, but after a time it becomes burning, and is then aggravated by warmth and relieved by cold and the recumbent position. The characteristic feature of the disease, however, is flushing of the painful area, coming on with exertion or when the feet are allowed to hang down. In aggravated cases the pain is so severe as to make walking almost impossible, and when walking is persisted in intense redness and swelling are occasioned.

I recollect one case, a patient of Dr. Mitchell's, in whom the pain was so intense that the patient would go about the house on his hands and knees rather than bear his weight upon his foot. No treatment seems to be of any avail in this disease.

A neuralgic affection of the foot, first thoroughly described by Thomas G. Morton in the *American Journal of the Medical Sciences*, Jan., 1876, consists, according to E. H. Bradford,[1] of pain situated at the base of the fourth toe, and often in severe cases radiating up the leg. The character of the pain may be dull or throbbing and extremely severe. The pain is aggravated by pressure, but usually disappears at night. Nothing can be detected by inspection. The affection is not an uncommon one, and is found much more frequently in women than in men, and occurs in those who are accustomed to the luxuries of life. Bradford agrees with Morton that the symptoms are due to pinching of the metatarsal nerve, rather than to flattening of the tarsal arch. In the majority of cases Morton advises the excision of the head of the fourth metatarsal bone and of such portion of the shaft as will prevent pinching of the external plantar nerve.

The cases reported by Bradford were of the idiopathic subacute or chronic form, and did not require operative procedure. The treatment adopted was the prevention of any lateral pressure on the foot. The patients were advised to walk barefooted as much as possible, and to use substances such as the oleate of atropine or of morphine in order to relieve the sensitiveness of the skin. In severe cases crutches were used for a time. It is also wise to stimulate the circulation of the part by the alternate use of hot and cold water. Unusually broad-soled shoes are desirable. Unless a considerable period of time can

[1] *Boston Medical and Surgical Journal*, July 16, 1891.

be given to the following out of the instructions, operative interference is necessary.

Lumbar neuralgia includes all of the forms having their seat in the distribution of the first four lumbar nerves. It is unusual for the whole of the branch of the lumbar plexus to be implicated at once.

In lumbo-abdominal neuralgia there is pain in the loins extending as far as the sacrum and in front of the hypogastrium. It is very much like lumbago in its symptoms, but is different from myalgia in that the pain radiates in various directions, and is not aggravated by movement so much as lumbar myalgia is.

Hypodermic injections of atropine in this condition often give relief, and sedative applications of aconite and chloroform are also useful. Salicylate of sodium internally in full doses is of advantage, and in some cases small and frequently repeated doses of fluid extract of rhus toxicodendron afford speedy relief. Actea racemosa is also efficacious in some cases. I have seen a prompt cure from antipyrine.

Crural neuralgia is occasionally met with, but it is not so frequent as sciatica. The pain is located in the middle and inner part of the anterior surface of the thigh, the anterior surface of the knee, and the inner surface of the leg and foot as far as the great toe. The painful points to be remembered in crural neuralgia are one in the groin where the nerve emerges from the pelvis, one on the inner side of the patella where the saphenous nerve appears beneath the skin, one at the front of the ankle-joint, and one at the base of the great toe.

The treatment of this form of neuralgia is practically the same as that of sciatica.

In order to facilitate reference to the different drugs and remedial agents used in the treatment of headache and neuralgia, I have classified them alphabetically in the following list, giving, however, one column to treatment of headache and another to that of neuralgia. The main body of this table has been prepared from the works of Brunton, Bartholow, Gowers, Hare, Wood, and from Sajous' *Annual of the Universal Medical Sciences.*

The numbers refer to the following works:

1. Neal's *Medical Digest.*
2. Ringer's *Therapeutics.*
3. Bartholow's *Therapeutics.*
4. Wood's *Therapeutics.*
5. Brunton's *Therapeutics.*
6. Hare's *Text-book of Practical Therapeutics.*
7. Sajous' *Annual of the Universal Medical Sciences.*
8. Gowers' *Diseases of the Nervous System.*

A number in parenthesis means that the author to whom the figure refers is responsible for the statement which precedes it:

Remedy.	Headache. *Use, Dose, and Authority.*	Neuralgia. *Use, Dose, and Authority.*
Acetanilid.	Migraine and neurasthenic headache, 5-grain doses every hour until 15 grains have been taken. Caution in its use.	Useful especially with monobromated camphor (6).
Aconite.	When circulation is excited (5). In migraine, $\frac{1}{200}$ of a grain of aconitine every two hours.	Ointment of aconitine (5), 1, 2, 3, 4. Ointment (grains 2 to the drachm) or oleate of aconitine (grains 2 to sweet oil 100), useful when applied over painful spot, if limited in area; if not, contraindicated (6). Internally, $\frac{1}{200}$ grain for neuralgia of the fifth (Seguin).
Acupuncture.		Needles dipped in oil of mustard and inserted over nerve, in sciatica. Nerve-stretching or neurectomy necessary in some cases (6), 1, 3.
Alcohol.	May do good at beginning, but often increases pain when headache has started (8), 2, 3, 4. Danger of habit being formed.	
Alum.		Intestinal neuralgia (4).
Ammonia.	Aromatic spirit in ½-drachm doses. Raspail's lotion locally very useful; often relieves nervous headache (5), 1, 2, 3, 4.	
Ammonium chloride.	10- to 15-grain doses in hemicrania (5), 3.	In intercostal neuralgia (8), ½-drachm doses (5), 1, 3, 4. In ovarian types (6).
Ammonium valerianate.	1, 4.	
Anæsthetics.	In extreme pain, where narcotics have failed to give relief, 2.	
Aniline.	When pain is very severe (5).	Neuralgias of unknown cause. Alcoholic neuritis (Combemale, 7). Ehrlich and Leppman, 7. Dose of methyl blue, 1 to 2 grains three to four times a day, or hypodermically at seat of pain (7).

Remedy.	Headache. *Use, Dose, and Authority.*	Neuralgia. *Use, Dose, and Authority.*
Antacids.	Sick headaches, 4.	
Antipyrine.	Migraine and other headaches, 5 to 10 grains at a dose. Efficacy increased by addition of sodium bicarbonate, 4.	Very useful (6), 4.
Aperients.	Often of value in various forms of headache, 2.	
Apiol.		Intermittent neuralgias (5).
Aromatics.		Intermittent neuralgias (5).
Arsenic.	In brow-ague (5). Anæmic headache.	Many forms of neuralgia.
Asafœtida.	When much mental depression in migraine (8).	
Atropine.	Locally to the eye in migraine (5), 2, 3.	As liniment or hypodermically near the nerve (5), 1, 3.
Belladonna.	Frequently given in frontal headache, especially at menstrual period, or from fatigue (5). Valuable in young people (6), 1, 2, 3, 4.	
Bebeeru-bark.	(5).	Neuralgias of fifth nerve.
Bicarbonate of sodium.	With bitters before meals in frontal headache, or pain in upper part of forehead without constipation. As wash to the mouth when headache depends on decayed teeth (5), 5.	
Bleeding.	In congestive headaches. 1.	
Blisters.	1, 4.	In sciatica. "Fly blisters" in neuralgia of fifth nerve.
Bromides.	In large doses (5), 3. With caffeine almost a specific (6). Especially useful in migraine, when there is no change in color of the face, or when the face is flushed throughout an attack (8).	
Bryonia.	In bilious headache (5).	
Butyl-chloral hydrate.	If due to eye-strain, 1, or associated with sick stomach (6).	For neuralgia of fifth nerve (5), 2, 3, 4, 6.
Caffeine or caffeine citrate.	In nervous headache (6), 1. Hemicrania.	Combined with sodium salicylate in neuralgia of fifth nerve.
Cajeput oil.	Locally (5).	
Camphor.	Internally, and saturated solution externally (5), 3.	

Remedy.	Headache. *Use, Dose, and Authority.*	Neuralgia. *Use, Dose, and Authority.*
Camphor liniment.	Locally to relieve pain (6).	
Cannabis indica.	Migraine. In neuralgic headache (5), 1, 3, 4.	Tic-douloureux.
Capsicum plaster.	To nape of neck (6).	Locally (5), 3.
Carbon disulphide.	Locally for congestive headache, 1.	Locally for trigeminal neuralgia.
Carbonic acid.		Locally for neuralgia, 3.
Cascara sagrada.	Nervous and bilious headaches (I. V. Stevens).	
Cautery.		Of great use, especially in sciatica (5), 1.
Chloral and camphor. Form a liquid.		Equal parts locally applied (5), 2, 3, 4.
Chloralamid.	Migraine and neurasthenic headache, grains 20 to 45, 6.	
Chlorate of potassium.		In facial neuralgia (5), 3.
Chloroform.	Spirit of, in nervous headache (5).	Locally and by inhalation, when pain very severe (5), 1, 2, 3, 4.
Chloroform liniment.		A local anæsthetic (6).
Cimicifuga.	In nervous and rheumatic headache, especially at menstrual period (5), 3. If due to eye-strain (6).	Especially useful in ovarian types (6). In neuralgia of fifth nerve and ovarian neuralgia (5), 2.
Cinchonidine salicylate.		3–5 grains every two hours.
Cocaine.	In neurasthenic headache, 3.	By anodal diffusion for neuralgia of superficial nerves.
Codeine.	Often preferable to morphine, 1.	
Cod-liver oil.	In headaches from debility and anæmia, 2, 4, 6, 8.	In sciatica, tic-douloureux, and neuralgias of old and feeble persons.
Colchicum.	For gouty headaches, 1.	
Cold affusion.	Congestive headache, 3.	
Copper, amoniosulphate.		Grain $\frac{1}{16}$ to $\frac{1}{12}$ after food, in neuralgia of the fifth.
Counter - irritation.	Over seat of pain, 3.	Over course of nerve.
Creasote.		Neuralgia of fifth, 1, 5.
Cupping.	To nape of neck in congestion (6).	
Diet.	Often of the greatest importance (8).	
Digitalin.	Grain $\frac{1}{60}$ twice a day for congestive hemicrania (5), 2.	

Remedy.	Headache. *Use, Dose, and Authority.*	Neuralgia. *Use, Dose, and Authority.*
Diuretics.	Of value in toxæmic headaches (8), 1.	
Effervescing preparations.	Such as antipyrine with salicylic acid and caffeine, or sodium bromide with caffeine.	
Electricity.	Faradism usually does harm in migraine (8), 1, 1, 4. Galvanism useful, 2.	Galvanism and static electricity for sciatica and trigeminal neuralgia.
Ergot or ergotin.	If due to congestion (6), 2, 4.	In visceral neuralgia (5), 3, 4.
Ether.	Inhalations in severe migraine. (See text.) 1, 3, 4.	
Ether spray.	Locally for frontal headaches after illness or fatigue (5), 3.	To the seat of pain.
Ethyl chloride.		Local application in temporal neuralgia. (Grandeclément, 7).
Eucalyptus.	In migraine (De Schweinitz and Lewis), 6.	
Exalgin.	English writers consider it dangerous. May be used with caution; 2 to 4 grains, for neuralgic headache.	Facial neuralgia, herpes zoster (Gorodichze, 7).
Exercise.	Often useful.	Often of service.
Freezing.		Freezing parts with ether or rhigoline spray, or by similar action of ice and salt, is successful if nerve is superficial (6).
Gelsemium.	If due to nervous troubles or eye-strain (6), 2, 3, 4.	In trigeminal neuralgia, especially if connected with decayed teeth. In sciatica.
Gold chloride.	1.	
Guarana.	Migraine and nervous headache. (See text.) With salicylate of sodium.	
Hot applications.	As hot water or poultice to nape of neck (5). In migraine or anæmic headache, 3.	
Hydrastis or hydrastinine.	In congestive headache with constipation (5).	
Hydrobromic acid.	If due to eye-strain in nervous women (6). Also, in congestive headaches.	
Hydrocyanic acid.		Useful in intestinal neuralgia (6), 3.

Remedy.	Headache. *Use, Dose, and Authority.*	Neuralgia. *Use, Dose, and Authority.*
Hygiene.	Of the greatest importance in all forms of headache.	In all forms of neuralgia.
Hypnotism.	Various forms of headache (Moll, 7). French writers approve its use.	Intercostal neuralgia (Bramwell, 7). Facial neuralgia (Eastlake, 7). Schmid, 7. Luys, 7. French writers praise its use.
Ice-bag.	Applied to head or leeches behind ears in severe cases (6). Congestive headache.	In sciatica (W. Mitchell).
Ignatia.	In hysterical headache (5).	In hysterical cases and in intercostal neuralgia (5).
Iodides.	Useful in organic headaches and those of syphilitic origin. In rheumatic headache with tenderness of scalp (5).	May be tried in rheumatic neuralgia (6). Useful in syphilitic forms (8), especially when nocturnal (5), 1.
Iodoform.		Has been found useful in sciatica.
Iris.	In supraorbital headache with nausea (5).	
Iron.	In anæmic and neurasthenic headache.	Arsenic and iron should be given when patient is anæmic; often necessary to associate with cod-liver oil (6), 2, 3.
Kataphoresis.	6.	In neuralgia of fifth nerve and sciatica (Corning, Peterson, and others).
Liquor magnesii citratis.	In sick headache (6).	
Magnesium carbonate.	Grains 5 to 60 in sick headache due to gastric acidity (6).	
Magnesium sulphate.	For frontal headache with constipation, 4.	
Massage.	In migraine and congestive headaches. Also of value in general treatment of neurasthenic cases.	In sciatica and other neuralgias "*effleurage*" should be employed.
Menthol.	As local application (5), 1.	Locally for supraorbital neuralgia, sciatica, and neuralgia of other superficial nerves.
Mercury.	In bilious headache (3). Bichloride, $\frac{1}{100}$ grain every two hours in syphilitic headache.	
Methyl blue. See *Aniline.*		

Remedy.	Headache. *Use, Dose, and Authority.*	Neuralgia. *Use, Dose, and Authority.*
Morphine.	Hypodermically in migraine or other severe head-pains, 1.	Grain $\frac{1}{5}$ to $\frac{1}{4}$ injected into painful spot if localized; not advisable in chronic cases (6). Hypodermically (5), 1, 2, 3.
Mustard.	As foot-bath or poultice to nape of neck (5), 3, in congestive and migraine.	As a counter-irritant (6), 5.
Nickel bromide.	In hemicrania (DaCosta), 1.	
Nitrite of amyl.	In anæmic headache. As an inhalation when face is pale (5), 1, 2.	
Nitrogen monoxide.	In migraine and anæmic headache (Birdsall and Hamilton).	
Nitro-glycerin.	In anæmic headache and migraine. Commence with small dose, $\frac{1}{150}$ to $\frac{1}{200}$ grain. May be combined with tincture of nux vomica, tincture of gelsemium, and dilute phosphoric acid, or with bismuth (2), 1, 2, 4.	
Nitro-hydrochloric acid.	For pain just above eyeballs without constipation, also for pain at back of neck (5). In lithæmic headache.	
Nux vomica.	Frequently repeated in nervous or bilious headache (5), 1 drop every five or ten minutes until 10 drops have been taken.	In visceral neuralgia (5). Or strychnine, if nerve is depressed by anæmia (6).
Oil of cloves.		Locally (5) in superficial neuralgia.
Opium.	Recommended by Day and others in congested forms of headache during paroxysms, 3.	
Oxygen.	In anæmic headache (Hamilton). (J. H. de Wolf, 7.)	
Peppermint.		Oil locally applied on cloth over painful spot (6).
Phenacetin.	If due to eye-strain (6), combined with salol for rheumatic headache. Very useful in migraine, grains 3 to 8 every two hours.	

Remedy.	Headache. *Use, Dose, and Authority.*	Neuralgia. *Use, Dose, and Authority.*
Phenyl urethane (euphorin)	Hemicrania, 3 to 6 grains three to five times daily (F. Adler, 7).	Supraorbital neuralgia, sciatica (F. Adler, 7).
Phosphorus.		If due to nervous exhaustion (6), 1, 2, 3, 4, $\frac{1}{50}$ to $\frac{1}{30}$ grain. Often fails, but at times good (8).
Picrotoxin.	In periodical headache (5), 2.	
Podophyllin.	Bilious headache, when constipation (5), 2.	
Potassium cyanide.	As local application (5), 2.	
Pyrethrum.		As masticatory (5).
Quinine.	5.	In periodical cases (5), 3, 4. Great importance in sciatica.
Rest.		In sciatica and other neuralgias (Mitchell).
Rest cure.	Anæmic and neurasthenic headache, hemicrania.	Very useful in exhausted patients (6).
Rubefacients.	To seat of pain and nape of neck.	Neuralgic pains relieved by (5).
Salicin.	Rheumatic headaches, 1.	
Salicylate of sodium.	3-grain dose every hour exceedingly useful (5) in rheumatic headache and migraine, 1, 3.	Sciatica, 15 grains three or four times a day. Trifacial neuralgia.
Sanguinaria.	In gastric derangement (5).	
Sodium phosphate.	As laxative in bilious headache (5), 2, and migraine.	
Spectacles.	For headache due to eye-strain.	
Spinal ice-bag.	Neurasthenic headache, 3.	
Strychnine or nux vomica.	If due to eye-strain (6), 1, 2.	Hypodermically for tic douloureux.
Sumbul.	In nervous headache.	Sometimes very useful (5).
Tea.	Strong, black or green, often relieves nervous headache quickly (5), 3.	
Tonga.	1.	Neuralgia of fifth.
Turkish bath.	Congestive headache and headache after debauch.	May relieve if due to rheumatism or gout (6).
Turpentine.	1, 2.	Locally for sciatica.
Valerian.	In nervous or hysterical cases (5). In migraine when much depression (Latham, quoted by 8).	5.
Veratrine.		Ointment locally applied over neuralgic nerve (6), 2, 3, 4.

Remedy.	Headache. *Use, Dose, and Authority.*	Neuralgia. *Use, Dose, and Authority.*
Vibration.	5.	In sciatica (Granville Mortimer).
Warmth.	Wise to keep extremities warm, 8.	

THE DRUG-HABITS.

By F. X. DERCUM, M. D.

Drug-habits present so many complex questions that it is necessary to consider briefly their nature and etiology before attempting to discuss their treatment. Roughly speaking, they occur by preference in three groups of individuals: first, in those in whom there is a neurasthenia or a neuropathy, either hereditary or acquired; secondly, in those in whom a habit has followed the prolonged use of a narcotic or sedative prescribed for some illness; and, thirdly, in those in whom a habit has been acquired incidentally to social life. The first class is separable, as indicated, into those in whom the habit is associated with hereditary or congenital neurasthenia; and those in whom the habit is associated with acquired neurasthenia.

It has long been known—indeed, it is a matter of lay experience—that some of these habits, especially alcoholism, are hereditary, and pass sometimes uninterruptedly from generation to generation. It behooves us, therefore, to consider, briefly, the characteristics of the constitution in which hereditary inebriety occurs. As a rule, there is a more or less pronounced family history of neurasthenia, of headache, and other functional nervous troubles. In addition, a neuropathic element may be present; thus it sometimes happens that in the same family in which hereditary inebriety occurs there are also instances of the insane neurosis, of marked eccentricity of character, or of excessive precocity or genius running hand in hand with imbecility and idiocy. In other cases, though more rarely, a history of insanity or of epilepsy is noted. In cases presenting a history of neuropathy, treatment, it is needless to say, is very unpromising. In cases in which the family history suggests merely an hereditary neurasthenia the outlook is somewhat better, provided measures can be instituted controlling the manner of living, occupation, and other factors involving the degree of nervous strain to which the individual is subjected.

In cases belonging to the second subdivision of the first-named group—those in which the drug-habit occurs as a result of acquired neurasthenia—the problem of treatment is an essentially different one and decidedly more hopeful. Here, evidently, the treatment is

to be directed to the underlying nervous exhaustion. Again, in considering cases in which the drug-habit is acquired as the result of the long-continued use of a drug or stimulant prescribed medically, we should remember that persons of a normal nervous organization are not likely to form pernicious habits under even these circumstances; and if such a habit be formed the suspicion is justified that an hereditary neurasthenia or a neuropathic factor is at work. Thus, if after the treatment of a case of typhoid fever it is found that the patient has acquired the alcoholic habit, we should inquire as to a family history of inebriety or of various functional nervous troubles suggesting neurasthenia or neuropathic conditions. To strictly normal individuals the use of stimulants—especially of alcohol—beyond the limits prescribed by ordinary social usage, is unpleasant and distasteful; and even when, as the result of special social occasions, alcohol is taken to excess by such persons a disgust for the drug ensues which leads to a period of relative abstinence. In neurasthenic, and especially in neuropathic, individuals, the after-depression from the excessive use of stimulants is so great, and is accompanied by so much psychic pain and physical suffering, that a craving for the drug ensues.

Inebriates, especially alcoholics, are also separable into two classes, as follows: first, those in which the drug or stimulant is used habitually day after day—of this class the so-called moderate drinker is typical; secondly, those in which the stimulant is taken at regularly or irregularly recurring periods, the intervals between the attacks being characterized by more or less complete abstinence. In such persons an attack may be provoked by unusual nervous overstrain or may recur at certain physiological periods, such as the menstrual epoch. Again, it may be provoked by the use of a stimulant socially or in accordance with medical advice. To this class especially belongs the periodic inebriate, the one who goes "on sprees."

The above remarks, while they apply in part to other drugs, apply especially to alcohol. Other drug-habits, it may be here stated, present peculiarities of their own. At the same time, the general statements applicable to alcoholism apply in a great measure to them. It would seem proper, therefore, to give to alcoholism our first attention.

ALCOHOLISM.

Acute Alcoholism.

Alcoholism occurs in two forms: (1) acute alcoholism; (2) chronic alcoholism. Chronic alcoholism occurs, as we have just seen, in the continued and the periodic forms.

We will consider first acute alcoholism. Acute alcoholism varies from conditions in which there are present transient exaltation or delirium to those in which there is present profound coma; and if the excess be continuous or be repeated at short intervals in succession a condition at last ensues characterized by acute delirium and signs of exhaustion, the so-called delirium tremens.

With the attack of acute alcoholic intoxication we have, in the consideration of drug-habits, really little to do. A few words, however, as to the management of such an attack may not be out of place. If there is reason to believe that there are still large quantities of unabsorbed alcohol in the stomach free vomiting should be induced, either by the administration of copious draughts of warm water, of mustard, or of other remedies by means of which the stomach may be readily evacuated. Subsequently, or even without the previous administration of an emetic, it may be of advantage to administer a brisk cathartic; and to this end a saline purge, such as a full dose of Epsom salt, is frequently efficacious. At times it is better to administer a pill of blue mass or calomel before giving the salt. If a Turkish bath be available, this measure may also be instituted. The Turkish bath stimulates the skin to such a degree that the poison is rapidly eliminated, and probably it also stimulates the elimination of the drug by the lungs. It is not an uncommon experience with some men to become intoxicated at a dinner, and then, after repairing to a Turkish bath, emerge at the end of an hour or more almost, if not completely, sober. If the Turkish bath be not available, a full hot bath in an ordinary tub is often efficacious.

Measures should also be instituted for averting the post-alcoholic headache, which is often of great severity. It is well, therefore, after having given a Turkish or hot bath, before allowing the patient to rest or go to bed, to administer a full dose of one of the bromides, say a drachm. This remedy is so efficacious, indeed, that in many cases in which the bath is not available the bromide itself permits the patient to awaken the following morning with little or no cephalic distress. The effect of the bromides is much increased by combination with a dose of antipyrin. Caffeine also is useful. Various combinations of the bromides with caffeine are sold in the form of effervescing draughts by druggists.

Treatment of Delirium Tremens.—If the alcoholic debauch has been sufficiently prolonged and sufficiently deep, the condition known as delirium tremens intervenes. Measures should at once be instituted such as are indicated in ordinary delirium when associated with profound exhaustion. Almost always a certain amount of physical restraint becomes necessary; and this is best accomplished by fastening the patient in bed by means of sheets drawn

firmly over his body or over his limbs, but in so doing we should be careful not to impede respiration. Often it is necessary to put leather gauntlets on the wrists and ankles.

As in other asthenic states, a treatment should be adopted the aim of which is to support the strength of the patient. Milk, eggs, beef-tea, beef-peptonoids, and other beef-preparations should be employed. These should be given in as large quantities as it is possible to administer, and at short intervals, say of one or two hours. At the same time strychnine and digitalis should also be given, the former in doses from $\frac{1}{40}$ to $\frac{1}{20}$ of a grain every four hours. It should be administered hypodermically. Some judgment is, however, necessary in this respect, inasmuch as the insertion of the syringe frequently increases the terror of the patient and enhances his hallucinatory delusions. Digitalis should be given in from 8 to 15 or 20 drops at a like interval (four hours), the dose being guided by the condition of the pulse.

Whether alcohol should be administered in a given case is a matter requiring careful consideration. As a rule, it is necessary to give a certain amount of alcohol; sometimes it must be given very freely. It will be found, however, that in many cases in which forced feeding is practised, and in which full doses of strychnine and digitalis are being administered, the alcohol can be limited to relatively small quantities. However, when in spite of other measures the pulse fails and becomes very frequent and weak, and the skin becomes cold and clammy, alcohol must be given in full doses.

In the majority of cases the physician is also compelled to resort to various sedatives in order to induce sleep. It is the habit of the writer to prescribe a combination of bromide, morphine, and chloral. As a rule, such a combination is very efficacious. It should contain a maximum amount of bromide and but moderate amounts of chloral and morphine. The bromide, which should preferably be in the form of bromide of ammonium, should be administered in 1-drachm doses, while the chloral should be given in doses of but 10 or 15 grains, and the morphine in doses of $\frac{1}{4}$ of a grain. It is found, as a matter of experience, that in these patients sleep is induced with the greatest difficulty, especially in the beginning of the attack; and it is also well to bear in mind that hypnotics are capable of doing harm as well as good; and the dose should therefore be not too frequently repeated. Sometimes, however, it is absolutely necessary to increase the dose of morphine. At other times the extract of opium is advantageously substituted. Frequently, also, instead of the mixture of bromide, chloral, and morphine just mentioned, the writer makes use of moderate doses of trional, say 10 to 20 grains. In cases of ordinary severity, however, the trional will be found to be insufficient to con-

trol the symptoms. Hyoscine hydrobromate, $\frac{1}{100}$ to $\frac{1}{50}$ of a grain, may also be used, though in the hands of the writer it has not in this class of cases given much satisfaction. We should remember that if sleep be very difficult to induce, it is far better to tide over the restlessness by moderate doses of hypnotics than to push these excessively, especially as in the majority of cases sleep is quite readily induced on the second and almost always on the third or fourth day. As a rule, also, in cases that are properly fed, and in whom strychnine and digitalis are used judiciously, sleep supervenes without the excessive use of the narcotics. Sleep having been once established, it is a small matter to keep up feeding and rest until the attack has passed away.

Not infrequently delirium tremens is complicated by pneumonia, and then the patient's condition is indeed serious. In such cases the supportiug measures already discussed are doubly indicated. De Tours very properly points out that in this state opiates should be given in small doses, while alcohol should be given in abundance.

Chronic Alcoholism.

In chronic alcoholism the fact of an underlying neurasthenic or of a more serious neuropathic element is usually so evident that one is surprised to find how little it is taken into account in the various special methods of treatment in vogue. We find, it is true, that during withdrawal tonics by the mouth and various drugs, such as strychnine and atropine, hypodermically, are recommended, but no real attention is paid to the underlying nervous disorder itself. The importance of taking this factor into account and the success so frequently attendant upon such a plan will be presently pointed out.

Prognosis.—Before a plan of treatment is instituted we are invariably asked to give a prognosis, and into this, as has already been shown, various elements enter. Everything depends upon the family and personal history, and especially the manner in which the habit was formed. Thus the prognosis is most favorable, other things being equal, in cases in which there is a history pointing to an acquired neurasthenia; it is less favorable if the facts point to an hereditary or congenital neurasthenia; it is still less favorable if neuropathic features such as have been already dwelt upon are present; and is almost hopeless if, in addition, a history of confirmed hereditary inebriety is present. Further, other things equal, the prognosis is most favorable in cases in which the habit has been formed as a result of social drinking; less favorable in those in which it has resulted from or been incidental to some severe illness; and least favorable in cases in which it has arisen spontaneously in the form of solitary drinking.

Having determined as far as possible the etiology of a given case

of alcoholism and the degree in which neurasthenia or neuropathic features are present, it becomes necessary to study the physical condition of the patient to determine the presence or absence of organic visceral disease. To this end the liver should be carefully studied, bearing in mind, of course, the relation of alcoholism to cirrhosis. The heart and bloodvessels should be examined, bearing in mind fatty and atheromatous changes. Similarly careful studies of the urine should be made with a view to detecting chronic renal disease. The lungs also should receive a due share of attention; it is unnecessary to point out the significance of possible changes in these structures save to mention the not infrequent coexistence of phthisis and alcoholism, and the further fact that many confirmed alcoholics suffer from chronic bronchitis. The digestive tract also demands a very large share of our attention. Almost invariably there is present a marked chronic gastritis, which must be taken into consideration in the scientific treatment of the disease.

Treatment.—Having carefully studied our patient, the first problem that presents itself is the question of withdrawal of the drug. While opinions differ, it is the writer's experience that it is always best to attempt rapid or immediate withdrawal. If no recent exacerbation has occurred, this can as a rule be accomplished without much difficulty; if, however, the patient is just passing through an alcoholic attack or has recently committed more than the usual excesses, the withdrawal will have to be more gradual. The moral effect of a too gradual or too prolonged withdrawal is bad; and, as already stated, a withdrawal as rapid as is consistent with safety should be instituted. We should be guided largely by the nervous symptoms and by the action of the heart. Collapse, mental confusion, delirium, and excessive prostration, of course, demand a gradual withdrawal. Whenever possible the alcohol should be given with food.

Having decided the question as to the rate of withdrawal, it now becomes necessary to lay out a plan of treatment. Drugs, so much dwelt upon by others, are assigned a secondary value by the writer. In his judgment, natural therapeutic measures are far more important and lead to far more satisfactory and durable results. As we shall see, they are readily applicable to the underlying nervous disorders so commonly present in these cases. Drugs may, however, be used at the same time with advantage, but their employment depends upon each individual case. No routine method of their application, no one drug, no one formula, can be considered as applicable to every case. The use of a given drug depends entirely upon the symptoms present and varies with each case.

What special method, then, shall we adopt of treating the continuous form of alcoholism? It is, of course, evident that if neuras-

thenic features be present and are treated, if the general tone and vigor be improved, the desire for stimulants will be lessened. In some cases it is possible merely by strict attention to hygiene, to matters of diet, to hours of sleep and regulation of the various functions, to bring about a favorable result; but in the majority of cases such simple means will not suffice, and it is necessary to institute measures involving some degree of restraint. Unfortunately, as most governments are at present constituted, forcible measures of restraint, except in unusual cases, cannot be carried out, and there is at present no prospect of legislation upon this subject, so great is the prejudice against interference with the liberty of the individual. If possible, however, the consent of the patient to comply with certain conditions of treatment should be gained. In a few instances the exaction of a promise or the signing of the pledge will suffice. In others, again, and in by far the larger number of cases, more decided measures are necessary.

Men occasionally enter institutions for the treatment of inebriety voluntarily, and often, under the moral and social restraints of such asylums, the use of the drug is discontinued. A far better way—an ideal plan, but unfortunately a somewhat expensive one—consists in withdrawing the patient from his ordinary surroundings and instituting a system of absolute isolation, and at the same time placing him in the care of a specially trained nurse. Such a plan as this is in suitable cases almost invariably followed by the most gratifying results, results which also are far-reaching and frequently permanent; for the isolation of the patient gives the physician the very best of opportunities for the study of the morbid conditions underlying the disease and for their proper treatment.

The plan of the writer is to institute a form of so-called "rest-treatment." This plan, indeed, is followed in many cases even when the patient is not markedly neurasthenic, for the isolation in a room with a special nurse constitutes the most effective means of restraint that can be devised, while the moral effect is of the very best. It is the plan of the writer to place the patient in bed and to keep him in bed, not for days, but for many weeks, and to institute at the same time massage, baths, Swedish movements, electricity, and such other expedients as suggest themselves from time to time or are indicated by the case. It cannot be too strongly insisted upon that the victim of alcoholism is the victim of disease, and that very frequently the relief obtained from various distressing symptoms by merely remaining in bed is so great as to be followed by a rapid diminution in the appetite for the stimulant.

The patient having been placed in bed, it is frequently found necessary to administer small doses of calomel, and to follow these

after a time by a saline cathartic. The digestive tract having thus been prepared, systematic feeding should be commenced. As a rule, it is best to begin with a liquid diet. This should at first be limited to beef-tea, broths, soups, and meat preparations generally. As soon as possible, however, a milk-diet should be instituted. A great many alcoholics aver that they cannot take milk; that it increases the coating of the tongue, and that its ingestion is followed by nausea and loss of appetite; but, as a rule, we will be able to administer milk if the proper precautions are observed. The simple expedient of adding a little alcohol answers every purpose, for it is then readily tolerated by the stomach and acceptable to the patient. At other times, instead of adding alcohol to the milk, our purpose is answered by diluting the milk with some carbonated water, such as soda-water or Apollinaris. In other instances, again, it is a good plan to peptonize the milk. The cold process is generally preferable, inasmuch as the taste of warm peptonized milk is so unpleasant to the average alcoholic that he will usually reject it. It is a good plan to add the peptonizing powder to the milk just before the latter is administered. Sometimes it is necessary to abandon whole milk and to give the patient skimmed milk or buttermilk. With regard to the amount of the milk, it is best to begin with a very small quantity, say, three or four ounces, given at intervals of two hours. Many patients who cannot take milk in large quantities can take it in small amounts at short intervals and digest it without difficulty. It will also be noticed that the quantity of milk thus administered in twenty-four hours is insufficient to satisfy the wants of the patient. In two or three days, as a rule, especially if the intestinal tract has been thoroughly emptied by the administration of calomel and salts, the patient becomes very hungry and accepts the small doses of milk eagerly. The amount of milk should then be gradually increased, an ounce being added to each dose daily.

It will be found expedient in a very few days, at most four or five, to begin with solid food; we should begin, of course, with small quantities. It may consist of soft-boiled eggs, Hamburg steak, boiled rice, stale bread, etc. Little by little the patient may be brought up to a full diet, the milk at the same time being increased. In other words, we apply to the treatment of an alcoholic patient the general principles of diet in the rest-cure. Very soon it will be found that the patient is taking a very large amount of food, and that his condition is rapidly changing for the better. The nervousness resulting from the withdrawal of the alcohol subsides, and the desire for the latter diminishes. His spirits also rapidly improve, the depression disappears, and he becomes bright and cheerful.

During all this time, it must be remembered, the patient is receiv-

ing daily full general massage and sponge, shower, or spray baths, while the muscles are stimulated by electricity—usually the slowly interrupted faradic current. As the case progresses, Swedish movements with resistance are added. Soon it becomes necessary to permit the patient to leave his bed for small portions of time daily, until at the end of five, six, or more weeks he is up the greater part of the time. As soon as this is the case calisthenics and other room-exercises are instituted. Subsequently, according to the progress of the case, these measures should be followed by exercise in the open air—always, of course, in the company of the nurse.

It may occur to the reader that in chronic alcoholics a large amount of forced feeding such as I have here suggested in not indicated. A few minutes' reflection, however, suffice to convince us of the erroneousness of this view. In the first place, whiskey- and wine-drinkers are not likely to be obese. Even if they are their tissues are soft, flabby, and in a badly nourished condition. Those patients in whom the greatest obesity occurs, namely, beer-drinkers, rarely come under our care or treatment as alcoholic subjects. Should, however, the alcoholic subject be obese, this feature may be taken into consideration in the dietary. It is hardly necessary to say that in such cases whole milk should be substituted by skimmed milk; that starches and fats should be as far as possible excluded; and that lean meats, fish, green vegetables, etc., should be given—in short, we should adopt the ordinary diet for the reduction of obesity. In the experience of the writer the greatest number of those who come under our care for chronic alcoholism are not persons who are obese, but rather patients in whom the weight is distinctly below the normal; some, indeed, are excessively thin.

Occasionally it is possible to conduct the entire treatment without the use of drugs; but, as a rule, the latter may be advantageously employed. Indeed most frequently they are indicated. They are roughly grouped into three categories: first, those indicated by the symptoms arising from the withdrawal of the alcohol; secondly, those indicated by the deranged visceral functions; and, thirdly, those which are tonic, stimulating, or antagonistic to the action of alcohol.

The symptoms which arise upon withdrawal consist especially of markedly increased nervousness, of insomnia, and sometimes of headaches. As a rule, the indications can readily be met by the exhibition of the bromides. These may be given in doses of from 20 to 40 grains every four hours. The insomnia may be combated by trional (gr. xx), and, if this be not efficacious, by sulphonal (gr. xv to xx) or hyoscine hydrobromate (gr. $\frac{1}{100}$ to $\frac{1}{60}$). The use of morphine is unjustifiable. Chloral may be used, but it had better be avoided.

As already stated, there is almost always present a gastric catarrh; and this must be taken into consideration not only in the diet, but also in the medicines prescribed. Silver nitrate (gr. $\frac{1}{4}$), combined in pill-form with extract of hyoscyamus (gr. $\frac{1}{4}$), and administered three times daily a half-hour or twenty minutes before meals, has, as a rule, a very happy action. Occasionally, however, lavage is necessary, though this, even in severe cases, need not be continued very long. Occasionally the morning nausea and vomiting of chronic alcoholics is very troublesome; but, as a rule, it readily subsides. Sometimes small doses of calomel are indicated, and in others sodium phosphate can be given with advantage. The latter is best administered in doses of 15 grains in hot water early in the morning. At other times it may be given in an effervescent solution and repeated several times daily. Small doses of saline laxatives are also frequently of service during the first week or ten days of treatment.

The third category of drugs, as already stated, includes those which are tonic, stimulating, or possibly antagonistic to the action of alcohol; and it is unfortunately to these more than anything that attention has been directed both by medical authors and by the advertising pretenders of specific cures. The writer does not deny that some of them are of value—in fact, he not infrequently makes use of them; but it cannot be too strongly insisted upon that they should not constitute the main factor of the treatment. They are merely adjuvants, and if employed at all should be selected and adapted to each particular case. The drug most commonly resorted to is strychnine. It is generally given hypodermically in the form of the nitrate. As a rule, it should be employed in moderate doses, say gr. $\frac{1}{50}$ or $\frac{1}{40}$, three times daily; although occasionally much larger doses, gr. $\frac{1}{20}$ or even $\frac{1}{15}$ (Dana[1]), may be given. In the writer's experience, however, large doses overstimulate and tend to increase the nervousness of the patient. There can be no doubt that in most cases strychnine is beneficial, and that it markedly diminishes the depression of the period of withdrawal, and may even tend, as is claimed by Phelps,[2] to impair the appetite for alcohol. Though it has not in the writer's experience so valuable a property, no harm can be done by its use, especially in moderate doses. In many cases we must admit that its use is followed by most gratifying results. Combemalle[3] points out that it is contraindicated when there are episodes of excitement, delirium, or symptoms indicative of nerve-cell degeneration, or when there is present obvious disease of the liver or kidneys.

[1] *Post-Graduate*, New York, July, 1896.
[2] *Medical Fortnightly*, St. Louis, 1895, viii.
[3] *Gazette Hebdomadaire*, 1897, No. 39.

Another drug quite frequently used is atropine. Its stimulating qualities are apparently of much service in many cases of alcoholism. Like strychnine, it appears to lessen the depression caused by the withdrawal. It seems to diminish especially the distressing epigastric and sinking sensations from which alcoholics suffer. It should be administered hypodermically in doses varying from gr. $\frac{1}{100}$ to $\frac{1}{50}$, three times daily, and preferably with strychnine. Clark[1] regards the combination with strychnine as almost a specific. He maintains that while strychnine acts as a nerve-tonic the atropine has a special aptitude for decreasing the appetite for alcohol. Carter[2] also regards atropine as of special value. He declares that atropine given three or four times a day will produce a great distaste for alcohol in from one to five days; that whiskey becomes repellant as regards both sight and odor, and that its taste becomes intolerable, producing nausea. While this position is somewhat extreme, there can be no doubt that in cases in which there is marked depression with coldness and clamminess of the extremities the drug is extremely valuable, and it is not impossible that by combating these symptoms the atropine may indirectly lessen the craving for alcohol.

Among other drugs that are of use from time to time we should mention arsenic, iron, and bitter tonics. As regards the latter, we should be careful, of course, not to prescribe them in the form of tinctures. As a rule, their exhibition in pill-form with or without a small quantity of capsicum answers every purpose. Arsenic, if given at all, should be in the form of Fowler's solution, and should be given well diluted for fear that the chronic gastric catarrh almost invariably present may be aggravated. The writer has found it of distinct value, especially in the latter part of the treatment. If iron be indicated, it should be exhibited in the form of a peptonate, preferably associated with manganese.

A drug that has been brought into great notoriety in connection with alcoholism is the chloride of gold and sodium. It is not many years since that, as "bichloride of gold," it was heralded far and wide by advertising pretenders as a specific for alcoholism. As a matter of fact, the drug is almost inert, its action being that of an extremely feeble tonic and alterative unless it be given in large doses, when it acts as a gastro-intestinal irritant. Notwithstanding, there are not wanting medical writers who vaunt its merits—*e. g.*, Oliver Edwards,[3] who ascribes to it not only peculiar specific properties, but also declares that it brings about refreshing sleep and other equally remarkable things. It is very probable that the virtues attributed to the gold salt are really to be attributed to the concomitant use of strych-

[1] *New Orleans Medical and Surgical Journal*, vol. xxiii., p. 721.

[2] *Medical News*, March 9, 1895.

[3] *Canada Medical Journal*, March, 1896.

nine and atropine. Carter is evidently of a similar opinion when he says that the antagonism existing between atropine and alcohol is the real basis of the gold cure.

Apomorphine also is occasionally used in the treatment of alcoholism, especially in systems of treatment in which the patient is allowed all the alcohol he desires. If, in spite of the administration of strychnine and atropine, the patient continues drinking, apomorphine, $\frac{1}{10}$ of a grain, is given hypodermically at such times as the alcohol is taken. How unscientific this method is need not be pointed out. Comment is unnecessary. The same is true of any method of treatment which involves the substitution of another drug, such as morphine, cocaine, or chloral, for the alcohol; such practice cannot be too strongly condemned.

The writer is in the habit of applying to every case as far as possible the general principles of the rest-treatment, and employing strychnine, atropine, and other drugs only when indicated. It is certainly unscientific to treat every case in the same way. In cases treated on rest-principles it will almost always be found, long before the treatment has been completed—in fact, often before it is well under way—that the patient's appetite for alcohol has entirely disappeared. It will be found, further, after the treatment has been completed that the tendency to relapse is very slight. It is all-important, of course, to guard the patient against exposure to fatigue, alcoholic subjects being very readily exhausted. This fact should be constantly borne in mind when the time comes for the patient to resume the ordinary duties of his vocation. The majority of cases of relapse are those in which some indiscretion, either in the direction of overwork or repeated attendance upon social functions that are attended by loss of sleep, has occurred.

The greatest difficulty is presented by those cases in whom there is a strong hereditary or neuropathic element. These are the cases in which drunkenness comes on in periods or well-defined attacks. It must be frankly confessed that in cases of this kind nothing short of forcible intervention and restriction is efficacious, and this forcible measure, as already pointed out, cannot be carried out in this country save in some States—*e. g.*, Massachusetts, in which a special law is provided by means of which it is possible to restrain an inebriate just as the insane are restrained elsewhere. Drunkards demand the same care as the insane, and special institutions or special control should be provided for them. In Austria a procedure known as the *Curatel* has been instituted. This consists in the legal appointment of a curator or administrator, who acts in the capacity of guardian. Under the same provision public asylums for drunkards have also been established, and they have met with much favor. In this country we are

compelled to resort to other and less effectual means. However, if it be possible to induce a periodic drinker to submit to a prolonged course of rest-treatment, followed by exercise, the danger of recurrence of the attacks may be lessened. At any rate, in the management of such an individual everything should be done toward keeping the organism at as high a physiological level as possible, paying careful attention to every function. We should be careful, further, to point out to such a patient the danger of subjecting himself to severe nervous or other strain, and to enforce as much as possible such a regularity of living that abundant time is given for sleep and for the digestion of food.

In treating alcoholics it is important also to study special symptoms, such as the neuralgic pains and headaches which they present, while we must also be on the outlook for signs of actual organic disease either of the nerve-centres or of the peripheral nerves. These will demand various additions or modifications of the general plan of treatment. It is remarkable, however, how thoroughly and completely these symptoms, as a rule, disappear during rest. Even mental impairment, as indicated by loss of memory, feebleness of will and judgment, and impairment of the moral sense, is capable of great improvement. This is also true in a more limited sense of alcoholic insanity.

Of late years hypnotism has been suggested as a mode of treatment for alcoholism, more especially by Forel. Of its efficacy the writer has no personal knowledge. It is very doubtful whether any method of treatment which fails to recognize fully the pathological groundwork underlying the alcoholic habit can be successful. Certainly in all but very slight cases hypnotism can be no more efficient than in actual organic diseases. Further, as Crothers points out, alcoholics are, as a rule, very poor subjects for hypnotism.

MORPHINISM.

The treatment of morphinism resolves itself into the treatment of the habitual and of the occasional users of the drug. There are some patients who, like the periodic alcoholics, make use of morphine or of opium at only certain periods, and then again voluntarily abandon the drug. It is a common thing to find persons who suffer from recurring attacks of headache or neuralgia, or from menstrual troubles, periodic users of morphine. Women especially are prone to form such a habit. However, whether the drug be used occasionally or periodically, the problem of treatment remains essentially the same ;

but, as can be readily inferred, the treatment of the periodic users of the drug is far more difficult than that of those who use the drug continually. In this connection it may also be pointed out that it is, as a rule, less difficult to treat successfully a patient who uses relatively large quantities of the drug, but has done so for a short time only, than one who uses only small quantities, but has used them for many years.

Various methods of treatment are in vogue, all of which, however, lay special stress upon the method of withdrawal of the drug. For instance, some writers advise immediate withdrawal, others rapid withdrawal, and others very gradual withdrawal. Thus, Gilles de la Tourette advises sudden withdrawal if the patient has been taking large doses, say, 5 to 6 grains daily, and gradual withdrawal if the patient has been taking less than 5 grains; while Comby advises invariably sudden withdrawal. According to the writer's experience, it is best at first not to consider the question of withdrawal at all, but merely to institute such general measures as have been indicated in the section on Alcoholism. Here, again, no treatment is so efficacious as that of full-rest methods. Partial-rest methods fail. Full-rest methods, on the other hand, are crowned with success. As in the case of alcoholism, the patient should be placed in bed, should be carefully isolated, and should be placed upon a diet especially adapted to the case—one which contains large amounts of milk, fruit, and vegetables, and a relatively small amount of beef. Morphinists, as a rule, have a diminished appetite, and especially for meats. The remarks already made in regard to the diet in alcoholism apply with but slight modifications here. As a rule, the white meats (fish, oysters, breast of fowl, etc.) are well digested, and are found more beneficial than the red meats (beef, lamb, etc.). Rice again presents itself as an admirable article of diet. In addition to the rest and the special feeding, bathing, massage, and electricity should be systematically employed.

It is the practice of the writer not to begin withdrawal of the drug until rest-treatment is fully under way. We must remember that the morphine *habitué* labors under an excessive fear lest the drug be withdrawn too soon. Besides, sudden withdrawal always implies a period of frightful physical and mental suffering. Further, the patient is, as a rule, intensely distrustful. I know of no class of patients with whom it is more difficult to establish friendly relations or in whom it is more difficult to inspire confidence. However, if the patient learns after his first few days of rest and isolation that he is still receiving his hypodermic injections or that he is still being allowed his usual quantity of laudanum or opium, confidence sooner or later asserts itself, especially as the physical comfort re-

sulting from the bathing, massage, and proper diet soon becomes pronounced.

The practice of the writer is almost invariably that of very gradual withdrawal. The withdrawal should be so slow at first that the diminution of the dose is practically imperceptible; later on the reduction may be more rapid. If the patient has been in the habit of receiving hypodermic injections, it is the plan of the writer not only to reduce the dose gradually in the manner indicated, but also to begin adding to the injection small doses of strychnine nitrate, say $\frac{1}{50}$ of a grain, and if the skin be very moist small doses of atropine sulphate, say $\frac{1}{200}$ of a grain. It is needless to say that after the morphine has been discontinued entirely hypodermic injections of strychnine or of strychnine and atropine may be kept up for some time without informing the patient of the change. The physician should be especially cautioned not to make use of cocaine during withdrawal, or, in fact, at any time, inasmuch as the patient may sooner or later acquire the cocaine-habit with results equally disastrous. Besides, a large number of patients that come under our care for the morphine-habit have already acquired the cocaine-habit. The same remarks apply to the use of alcohol. Many of our cases, indeed, are instances of the "triple" habit, namely, morphine, cocaine, and alcohol.

In the management of morphine cases isolation is absolutely imperative. No one should have access to the room save the nurse and the physician. No letters, packages, or newspapers should be admitted to the room under any pretext. Patients practise all sorts of devices to secure possession of the drug. Bribery is attempted with servants, or an order for the drug may be written on a piece of paper, the paper wrapped about a coin, and the missive thrown out of a window; in the writer's experience this method has several times enabled the patient to procure the drug. It is remarkable also to what extent friends and relatives will enter into collusion with the patient to supply him with the stimulant, all fearing that the doctor is practising great cruelty and is withdrawing the drug too rapidly. Vigilance in such cases cannot be too great.

The reason for withdrawing the drug in the gradual manner described above is not only to diminish the sufferings of the patient, but also to prevent the onset of serious symptoms. Every now and then, if the drug be abruptly withdrawn, signs of collapse, diarrhœa, sweating, cardiac weakness, and dyspnœa, with excessive prostration, may set in. In other cases, again, mental symptoms resembling those of confusional insanity make their appearance, the patient becoming hallucinatory, delusional, and finally delirious. Such symptoms are not likely to make their appearance if the drug be with-

drawn in the manner indicated and under fully established rest-conditions.

The treatment of the morphine-habit by the rest-method should be continued for a very long period. In the writer's experience, the period which is sufficient for ordinary cases of neurasthenia or hysteria is totally insufficient for cases of morphinism. A course of three months of treatment is, as a rule, absolutely demanded, and in many patients the treatment should embrace five, six, or even seven months. The writer does not mean to imply that the patient should be kept in bed during all of this period, but that full-rest methods should be kept up for from three to four months, and after this a partial-rest treatment should be instituted, the patient being up and out of bed and exercising out of doors daily for some three or four hours. In cases so treated the writer has met with most gratifying results. Success, it need hardly be stated, is still further assured if the patient's nurse accompany her to her home or elsewhere and remain with her for a period of several months longer. If practicable, the entire length of treatment under the supervision of the nurse should extend over a year. In no class of patients is relapse so apt to occur as in morphine cases, and it is for this reason that every possible precaution should be taken, provided the patient's means permit it.

With regard to the management of morphine cases subsequent to the rest-treatment, the general principles already indicated in the section on Alcoholism are applicable here. Everything should be done in the way of proper diet and exercise to keep the patient's health at as high a level as possible. But here also it is important to avoid fatigue, and especially strain, excitement, and worry. Many cases presenting special difficulties are cases in which the habit has been acquired for the relief of a painful affection which still continues, as, for example, a persistent neuralgia, frequently recurring headache, or painful menstruation. It is needless to point out that every effort should be made to discover and, if possible, eradicate the cause of the painful affection whatever it may be, treating the headache or neuralgia upon such principles as are indicated; or if functional or organic disease of special structures be present—*e. g.*, pelvic disorders in women—instituting such means, medical or surgical, as are necessary.

Because morphine patients are so untrustworthy, and because the means of obtaining the drug save under absolute isolation are so many, the physician should carefully watch the patient in order to learn whether the drug is really being withdrawn. Absolute supervision is possible only under absolute isolation, and yet by the most unexpected means the patient may be placed in possession of the coveted stimulant. However, if the quantity of the drug administered is really being diminished, certain symptoms inevitably make

their appearance. They are, first, restlessness, which may become very marked, and is accompanied by more or less insomnia. The patient also yawns a great deal or sneezes, complains perhaps of having caught a slight cold, or perhaps has an attack of difficult respiration, simulating asthma. In addition to restlessness, the patient manifests signs of fear, complains of a sense of oppression, declares himself dissatisfied with the treatment, and insists upon going home. Involuntary movements of the legs and arms also make their appearance, the limbs being thrown about the bed. At times this is merely due to restlessness; at other times distinct involuntary jerkings make their appearance. Intention-tremor also becomes evident. When, for instance, the patient attempts to pick up a glass of water it is noticed that he trembles decidedly. Sometimes, instead of an asthmatic attack, all the symptoms referable to a cold in the head or a spasmodic cough may make their appearance. Sometimes vesical tenesmus is noticed. Palpitation of the heart may be also evident, or the patient may complain of fluttering sensations in the præcordia.

It stands to reason that, if none of the above symptoms are present, and if the patient continues comfortable and in good spirits, sleeps well, and is contented with his surroundings, he is obtaining the drug surreptitiously. It should be remembered that even under very gradual withdrawal some of the symptoms mentioned above make their appearance, and may, indeed, become so marked as to necessitate for a time a return to a larger quantity of the drug. No picture is more alarming than that often presented by morphine patients in the stage of withdrawal, especially if the depression produced by the vomiting and diarrhœa be accompanied by mental confusion and delirium. These symptoms cannot be relieved by other remedies, and a recourse to morphine for a time is not only indicated, but is really the only course to pursue. The history of withdrawal in a confirmed case of morphinism is, in the experience of the writer, not a steady and unbroken decrease in the quantity of the drug, but consists of a series of diminutions, the progressive decrease being every now and then broken by a return to a slightly larger quantity. The detailed method of diminution depends largely upon the individual case under treatment. The writer, as a rule, continues for a number of days the quantity of morphine which the patient habitually takes; he then begins the diminishing of doses given in the early portion of the day; those given at night are continued in full quantity for a somewhat longer period. This is contrary to the practice of others, who begin by diminishing the evening doses. In the writer's experience, cutting off the evening doses makes the patient restless and sleepless; while the diminution of the morning dose, though producing restlessness, is not attended by the great disadvantage resulting

from insomnia and its attendant evils. No hard-and-fast rule can, however, be said to apply. The patient should be given the drug when he needs it most, and it should be first diminished or withdrawn at those periods when he needs it least. Inasmuch as morphine injected hypodermically is eliminated by the stomach, and is subsequently reabsorbed by the intestines, Hitzig has suggested that in treating morphinism we should systematically wash out the stomach. This seems to the writer to be an unnecessary precaution. The procedure is one that adds greatly to the distress from which the patient is already suffering, and it is doubtful whether the morphine thus gotten rid of is really large in amount.

As already stated, during withdrawal we should make free use of hypodermic injections of strychnine nitrate and atropine sulphate. As in the management of alcoholism, the dose must be adapted to each case. In morphinism much larger doses of these drugs are tolerated. However, in many cases it is possible to bring about withdrawal without their use. Occasionally it is a good plan to use digitalis or strophanthus. As the treatment progresses, and during the convalescent period, bitter tonics, mineral acids, iron, arsenic, or malt and other nutrients may be added as seems expedient.

Among drugs to which especial virtue in the treatment of morphinism has been ascribed we should mention sodium phosphate. It has been especially advocated by Luys.[1] He believes that it has a supporting action on the nervous system and should be given hypodermically. Beyond purely theoretical considerations the drug has nothing to recommend it. Cocaine, which is recommended by Skene, Mattison, and more recently by Keugla,[2] is merely a makeshift substitute, and should not be resorted to. Caffeine, also recommended by some writers, may occasionally be used in cases in which withdrawal is followed by great depression, or in cases in which the early morning depression is very marked. It should not be given toward evening for fear of adding to the insomnia. Insomnia and restlessness not infrequently demand the use of the bromides. Ammonium bromide may be given in doses of 30 to 40 grains at intervals of four hours. Trional may be used in its stead, especially toward night. At times sulphonal may be given; but, if possible, it should be avoided, as should also chloral, as both of these drugs favor the confusion and delirium occasionally met with in severe morphinism. The hot bath offers a harmless and often a very efficient method of combating the insomnia. Suggestion, advocated by some writers, with or without hypnotism, is of little or no value in the treatment. Hirt,[3] for instance, treats cases outside of institutions if

[1] *Gazette des Hôpitaux*, Paris, 1895. [2] *Occidental Medical Times*, 1895, xi., p. 541.
[3] Hirt, *Wiener med. Presse*, 1898, 43 and 44.

the daily dose is not greater than 0.25, 0.50, or at most 0.75, with the aid of hypnotism. He places a reliable female nurse in charge of the patient. The morphine is then suddenly withdrawn. Sleep is produced by chloral or trional, or by warm baths. In four or five days treatment by hypnosis is begun. Hirt states that only a slight degree of hypnosis is required. The treatment extends over a period varying from twenty-one days to eight months, but recovery can be regarded as established only in one-and-a-half to two years after the last hypodermic injection has been given. Certainly the method has nothing to recommend it on the ground of economy of time. Besides, success seems to be very doubtful. It cannot but be greatly inferior to treatment directed primarily to the re-establishment of the general health, such as is embodied in the application of rest-treatment. Dr. W. W. Winthrop, of Fort Worth, Texas, has recently called attention to the employment of "Husa"[1] as a remedy for the cure of the opium-habit. Husa appears to be an unclassified, or at least unidentified, plant found in the Everglades of Florida. According to Winthrop, it is a diffusible stimulant, causing gentle excitement, followed later on by sedation and sleep. From three to four months are necessary to effect a cure. It appears also that precautions must be taken to prevent the formation of a husa-habit. The treatment of the opium-habit by this means appears to be open to the same objection as are other methods which depend upon the substitution of one drug for another.

A discussion of the treatment of morphinism is perhaps incomplete without referring to one of the means by which the habit is often brought about and perpetuated, a means, moreover, which is largely under our own control. A painful fact thrusts itself upon us in that the morphine-habit generally has its origin in the prescription of the drug by a physician for some transient affection. Physicians cannot rid themselves of the great responsibility involved in the abuse of this drug, and it cannot but be admitted that it is too frequently prescribed for comparatively trivial affections, and that some physicians are altogether too ready with the use of the hypodermic syringe. Every prescription containing morphine for the relief of pain should be marked above the physician's signature with the imperative order not to be renewed. Refilling a prescription so marked renders a druggist liable to prosecution, and physicians can by this simple expedient exercise a certain amount of control over their patients. Further prescriptions for the relief of pain should be for a few doses only, and the patient himself should be warned against the unnecessary repetition of the dose. Again, it has a number of times come within the knowledge of the writer that a physician

[1] *New York Medical Journal*, April 16, 1898, p. 538; also June 25, 1898, p. 906.

has directed patients to purchase hypodermic syringes in order that he should not be annoyed or disturbed by too frequent calls. Such a course cannot be too strongly condemned. Another and prolific source of the morphine- or opium-habit is the ease with which narcotics can be purchased by the layman; and although laws exist which forbid the dispensing of poisons and narcotics without physicians' prescriptions, violation of the law is a matter of very common experience.

COCAINISM.

As mentioned in the preceding section, cocainism is sometimes acquired as a concomitant of the morphine-habit or during the unscientific treatment of the latter. A far more frequent cause of the cocaine-habit, however, is the use of the drug in the treatment of affections of the nose. Not only is cocaine applied by the surgeon preparatory to the performance of trivial operations, but it not infrequently happens that the patient is furnished with a solution containing cocaine which he is directed to apply either by means of a cotton pledget or by means of a spray. Within the writer's knowledge not a few cases of cocainism can be traced to some misapplication of the drug, the victim not infrequently being himself a physician. In prescribing cocaine for purely local affections we incur a responsibility not less than that which we incur in prescribing morphine. We should never lose sight of the fact that every local application is accompanied by a certain amount of general action. After the use of cocaine over a large mucous surface, such as the nasal chambers, the patient experiences not only local anæsthesia, but a comfortable sense of warmth and well-being diffused over the body. Further, the nerve-centres are stimulated, especially if the doses have been large, very much as they are stimulated with alcohol, save that the stimulation is far more intense and sudden.

A patient upon whose nasal chambers cocaine has been freely used soon becomes talkative, often boastful; but in a little while fatigue and relaxation supervene. Soon he experiences a need for the repetition of the dose, and little by little the habit is established. If the drug be withdrawn for some time, or if the patient fails of access to the stimulant, he is soon seized with a feeling of great discomfort, of marked oppression, of faintness, palpitation, and general nervousness. There is in addition a marked mental irritability, which is manifested by sharpness and shortness of speech and jerkiness of manner. The cocainist soon becomes unable to attend to his

business. He becomes readily and excessively fatigued. In a short time also it is noticed that judgment and memory become impaired, and his regard for truth becomes as small as that of the morphinist. Often he is full of business which is never completed; he is talkative and boastful, but neglects his obligations. At the same time it is noticed that he is pale and haggard; that his general nutrition is much impaired, and that his weight is below normal. Often he presents a picture of premature senility. His reflexes are exaggerated. His movements are those of unrest and constant change of position. At times his muscles are the seat of spasmodic twitchings. His pupils are dilated. Frequently there is tremor of the tongue and sometimes of the hands. His pulse is rapid and he frequently suffers from palpitation. His skin is likely to be cold and moist. He sleeps but little—often, indeed, insomnia persists for days. In addition he may present various symptoms of mental confusion and delirium. Sometimes he is the victim of delusions of persecution. At other times he becomes, if married, insanely jealous, and may, as in alcoholism, entertain the delusion of marital infidelity. Not infrequently hallucinations make their appearance, visual and auditory, and especially hallucinations referred to the cutaneous surface. The patient frequently believes that there are vermin or fleas upon his person, or in his bed or about his room; and he often spends a large part of his time in bathing, rubbing, scratching, or in making efforts to rid himself of the imaginary pest. So frequent is this hallucination of cutaneous sensibility that a patient presenting it is said to suffer from the "cocaine bug."

During the withdrawal of the drug these symptoms become much exaggerated, and we have recounted them in brief in order that the physician may be able to tell whether withdrawal is actually taking place. Contrary to what one might expect, it is, as a rule, practicable to withdraw cocaine far more rapidly than either morphine or alcohol. It is true that insomnia, palpitation, dyspnœa, and collapse are liable to occur, but they can be much more readily controlled. The writer, as a rule, practises immediate withdrawal. The bromides, especially when associated with 5 or 10 grains of antipyrin, are very efficacious in combating the symptoms. Coffee assists materially in lessening the depression during the day, while trional or sulphonal readily induce sleep at night. Many cocainists sleep spontaneously after the mere withdrawal of the drug.

As already stated, the cocaine-habit may have been acquired in the attempt to cure the morphine-habit, and cocainism and morphinism may exist together. In such cases, the cocaine may be entirely withdrawn at once. The morphine, however, should be withdrawn in the gradual manner already described. Similarly, the patient may

be the victim of the so-called "triple habit;" that is, he may use not only morphine and cocaine, but also alcohol. Here the problem presented often taxes our ingenuity. As a general rule, however, it may be stated that it is expedient to withdraw the cocaine at once, the alcohol rapidly, and the morphine slowly. The morphine distinctly overshadows the other drugs, and, as a rule, it had best be continued in full doses for a number of days. Later it may itself be gradually diminished. In other words, the treatment of this "triple habit" resolves itself sooner or later into that of simple morphinism.

It cannot be too strongly insisted upon that rest and isolation, as detailed in the sections on Alcoholism and Morphinism, apply equally to the treatment of cocainism. The cocaine patient is even less to be trusted than the morphinist. He is, when the habit is confirmed, tricky, treacherous, and utterly untrustworthy. I know of no class of cases more difficult to control. Confinement in a room under the supervision of a trained nurse, and to which room no other person but the physician has access, presents practically the only favorable prospect of cure. As in the case of morphinism, this isolation should be practised for from two to three months or longer. The general principles already indicated with regard to the use of tonics in the convalescent period of morphinism apply equally here. We should remember that our patient is below weight, and that he presents the symptoms of nervous exhaustion to a profound degree.

CHLORALISM.

The chloral-habit is less common than the other drug-habits thus far considered. Like morphinism, it frequently owes its inception to a prescription by a physician for some transient disorder, the patient renewing the prescription without the physician's knowledge or consent. Little by little the patient becomes accustomed to its use, and soon cannot sleep without it. It is a poison which is depressing to the heart and vasomotor apparatus. Dyspnœa, vertigo, and general sense of weakness are among the symptoms likely to be present. In well-established cases there are marked nervousness, marked insomnia, and a certain degree of mental weakness as manifested by loss of will-power and failure of memory. In some cases an emotional depression is present which may simulate melancholia. The patient is weak, his movements are tremulous, and he frequently complains of palpitation of the heart.

The treatment of chloralism is to be carried out on the lines already indicated. Care should be taken, however, not to withdraw the drug too suddenly, inasmuch as all of the symptoms of its use become rapidly accentuated by sudden withdrawal. Other narcotics, such as trional or sulphonal, must be employed. At times even morphine must be resorted to. The danger is, of course, that the patient may acquire a new habit. Occasionally he suffers so severely from the enfeebled action of the heart that it is necessary to prescribe alcohol; and under these circumstances, if care be not exercised, the alcoholic habit may be formed. However, the general principles already indicated in the previous sections should be closely followed. Isolation, absolute rest in bed, with massage, bathing, forced feeding, and perhaps the use of electricity, should be instituted. The drug should always be withdrawn very gradually, and, if possible, without the substitution of any other narcotic. Indeed, it may be safely said that any treatment which embodies the substitution of some other narcotic is in danger of failure. Strychnine, atropine, and digitalis should be freely used in order to tone up the weakened heart and vasomotor apparatus. The treatment should never be entered into without a full appreciation of the dangers of withdrawal. The withdrawal should never be begun without full isolation, because, in the writer's experience, the patient is in danger of beginning the free use of alcohol, being driven thereto by the intense psychical and physical depression.

OTHER DRUG-HABITS.

It not infrequently occurs that patients become the victim of narcotic habits other than those already discussed—*e. g.*, trionalism or sulphonalism. Sometimes, also, some of the less commonly used narcotics, such as paraldehyde, somnal, or chloralamide, are the stimulants to which the patient becomes addicted. One of the worst and most horrible cases of drug-habit which it has been the writer's experience to treat was a case of paraldehyde-habit, in which the patient took enormous doses of this disgusting narcotic daily. The patient constantly reeked with the unpleasant odor of the drug, while her mucous membranes were ulcerated and her form much emaciated. Occasionally ether and chloroform are used by inebriates. Among the rarer forms of drug-habits met with at the present day are the phenacetin- and antipyrin-habits. These habits, however, are less harmful than those already mentioned, and

can, as a rule, be more readily treated. General principles, of course, are to be applied to the treatment of a drug-habit no matter what its cause. Among these let us restate, first, the isolation of the patient in such a manner that his access to the drug save as administered by the physician is absolutely cut off; secondly, the employment of such therapeutic measures as will bring the general level of the patient's health up to the normal. The permanence of the result obtained depends in a large degree upon the influence of friends and relatives.

THE DISORDERS OF SLEEP.

By HUGH T. PATRICK, M. D.

Disorders of sleep are to be classed with pain, dropsy, dyspnœa, and other distressing conditions that are simply symptoms of disease; and the rational treatment of these symptoms means the treatment of the underlying malady. But, as continuous pain may exhaust precious vitality and the organism demand relief without reference to the cause; as dropsy may seriously impede respiration or circulation and call for surgical intervention as a purely symptomatic treatment, so disturbance of sleep, although merely indicative of some ulterior morbid condition, may be, when prolonged, something more and require treatment as a pathological entity. More than this, the disorders of sleep—in particular, the loss of sleep—may be powerfully retroactive, aggravating the original and causative disease. It has been said that "the greatest of all conservative agents is sleep," and it is known that man is able to do without this "sweet restorer" approximately for the same length of time during which he can abstain from food; that is, about three weeks. That the well must sleep to remain well and that the ill must sleep to recover health would seem to be self-evident; but I am not in the least sympathy with such statements as the following from a prominent author: "In my opinion no one cause is so productive of cerebral affections as persistent wakefulness; for not only is the brain prevented from obtaining rest, but it is kept in a state of erethism which, if not relieved, must sooner or later end in organic disease." This may be true as regards isolated cases, but it teaches a bad pathology and encourages irrational and short-sighted treatment. Insomnia is the result, not the cause, of cerebral affections, and it does not give rise to organic disease. True, it may be the earliest manifestations of otherwise latent brain-disease, but the conscientious physician will search this out and treat it; not attempt to avert some indefinite and vaguely threatened disaster by attacking the insomnia.

As disorders of sleep are pre-eminently derangements for which routine prescribing is to be sedulously avoided, it has been thought best to treat of them to the greatest feasible extent under the head of the different maladies of whose semeiology they make a part. Find-

ing it, however, impossible to adhere strictly to this plan, the arrangement followed has been chosen as a compromise, not logical but convenient, and the subject is introduced with a few detached suggestions.

Regarding the *amount* of sleep required by the normal individual, there is no constant rule. Following precedent and the result of personal observation I should say that eight hours may be considered a fair average; but there are healthy persons who need only five hours, and others equally vigorous and active who want nine, ten, or even twelve hours of sleep. Women require more than men, and children more than adults. Concerning the requirements of advanced years authorities differ, but those who hold that a hale and hearty old age may be passed on less sleep than is necessary for the aggressive period of life seem to have the facts in their favor. It is said that manual laborers need more sleep than persons engaged in sedentary pursuits, but this can be true only in a general way. Intense mental application should have for counterpoise the recuperation of long hours of sleep. There is no doubt that a man's intellectual efficiency is closely related to his ability to sleep. But the amount of sleep cannot be regulated by a schedule of hours: the requirements of each individual organism must be the sole determining factor, and this is all the more imperative because the quality of sleep is of almost equal importance with its duration. If a person sleep eight hours and awake unrefreshed, there is something the matter, and such a state of affairs should not be allowed to continue. But the converse—or rather the apparent converse—does not hold strictly true, for in this, as in other matters medical, the statement of the patient is not always to be accorded implicit reliance. Some young men think it rather fine to be preternaturally active, to retire exceedingly late, sleep little, and still be efficient during the day. This is not physiological, and they may be regarded as laying up calamity for the future. Corresponding to this, there are foolish young women who have a pride in attending some social function nearly every evening during the season. They are providing hardships and distressing nervousness for after-life. These are indiscretions, not idiosyncrasies, and are for the family physician to prevent. Even apparently well-balanced business and professional men, physicians included, occasionally feel an abnormal gratification in working hard on insufficient sleep. For all such the following hints are considered to be *apropos*.

The tendency to sleep is not to be habitually resisted, much less is it to be overcome by means of tea, coffee, or other stimulants. Affairs of the day should never be carried into the night: utilizing the quiet hour after retiring for the solution of knotty problems can only be condemned. After a sufficiency of sleep waking naturally follows,

and the person who has to be rudely awakened is one who is curtailed in his allowance of slumber. To this rule there are exceptions, the sluggard being still extant, although the genus seems to have comparatively few representatives in this country. For the healthy individual the practice of taking a siesta is scarcely commendable. Nature's sleeping-time is the night, and if adequate sleep be then obtained the day nap is apt to do more harm than good. But for men whose occupation inevitably entails irregular hours, the faculty of sleeping at will is of inestimable value. Nearly every healthy individual can acquire this habit—numerous assertions to the contrary notwithstanding. This oft-affirmed inability, like the incapacity to digest milk, is generally a subjective myth. The word habit implies personal custom, and the faculty in a majority of cases is not acquired without cultivation. The general practitioner, especially, should court this gentle mistress with assiduity, as success may mean added years of health and usefulness. The habit of waking promptly and completely may also be cultivated and is greatly to be desired.

If there be such a thing as *simple insomnia*, it is the insomnia of habit. This may have originated in an adequate cause which has ceased to act, or it may have developed from bad usages in daily living; occasionally it is due to short-sighted or thoughtless training by parents. The subjects of such insomnia seldom attain to the dignity of "cases," and need only a few instructions regarding the formation of a proper sleep habit. A room, cool, quiet, and well ventilated, preferably with a single occupant; a sufficiency of covering, and if necessary a hot-water bottle, to counteract the physiological decline of temperature that occurs during sleep; an evening meal not necessarily light, but easily digested; a tranquil evening; a regular hour for retiring: these belong to the hygiene of slumber.

After *excessive physical exertion* even the most vigorous may be sleepless. For such, a hot bath followed by some hot, light food or hot, mild stimulant will meet every requirement.

DISORDERS OF SLEEP IN NEURASTHENIA AND HYSTERIA.

For the purposes of this article nice nosological distinctions are considered unnecessary, and the above terms are used loosely so as to include what is ordinarly understood by nervousness and the neurotic disposition. Belonging to these diseases or conditions are a host of abnormalities connected with sleep which may arbitrarily be segregated into insomnia, distressed sleep, disturbances peculiar to the times of

falling asleep and awaking, and excessive somnolence. The last is considered under Narcolepsy.

Insomnia.—On the threshold of a consideration of the practical therapeutics of the insomnia of nervous people, one involuntarily recalls the hackneyed recipe for cooking a hare. The first requirement in every case is to determine the presence of insomnia and its extent. For this purpose the statements of the patient are untrustworthy data. The troubled victim perhaps protests that he has not slept a wink for a week, or that he has averaged half an hour a night for months—assertions that shed considerable light on his mental state, but afford no accurate information as to his hours of sleep. Recalling the fact that loss of sleep for three weeks means death, the absurdity of these common and extravagant statements is obvious. Absolute wakefulness is not a common symptom of neurasthenia, and should never be assumed to exist except upon the authority of a second person. If a reliable nurse or member of the household determine the continuous absence of sleep, apprehension should be entertained of grave organic disease or of a psychosis—at least something more serious than neurasthenia or hysteria. In arranging such surveillance, however, it is well to have the patient ignorant of the fact; foreknowledge of it would be pretty certain to make him more wakeful and vitiate the observation.

Having confirmed beyond a peradventure the existence of insomnia and determined its degree, the next step is to discover its proximate and remote causes, as well as to carefully investigate any coexisting disorders which apparently have no connection with the symptom in question: in short, to make an exhaustive clinical examination. The interrogations cannot be too searching, nor can the physical exploration be too thorough. Details relating to the sleep habit must be accurately known. Falling within this category are the sleeping apartment, its occupancy, heating, ventilation, sewage, and tranquillity (or lack of it); the character of the bed and bedding; the hours of retiring and rising; customary and unusual disturbance. Passing now to the day, the habits from rising to retiring undergo the scrutiny of the medical adviser. Occupation, aims, ambitions, food, drink, exercise, diversions, associations, and particularly the manner of spending the evenings are reviewed, the possibility of drug-addiction being never forgotten. When private worries or secret passions constitute the foundation of the trouble the physician cannot be too tactful in investigation (and, it may be added, in treatment), but he should not fail to find the *fons et origo* of the mischief. Above all, any rooted trouble, fixed worry, or imperative conception, especially of a hypochondriacal nature, must be unearthed. For example, the unfortunate subject may be absolutely unable, in the unoccupied moments after retiring, to free him-

self from the idea that he has some serious disease, that he may die before morning, or that financial disaster is impending. Sometimes more trivial subjects as seriously engage his attention. The thought of burglars, a man under the bed, or the possibility of fire; a harassing doubt as to whether doors have been locked, lights extinguished, or other duties properly performed may keep sleep from weary eyes. Some persons are wakeful simply from excessive anxiety to sleep: they remain awake to watch the approach of slumber.

It seems needless to insist that the state of every organ is to be determined; that it is not sufficient to know that the patient is struggling with financial difficulties, brooding over domestic infelicity, or suffering from consuming grief. He may in addition have nephritis, valvular disease, or incipient dementia paralytica. That insomnia is an early symptom of many diseases, and may be for some time the sole distressing manifestation, should be notorious.

Putting aside for the present the organic, toxic, and other cases to be considered later, and confining our attention to ordinary nervous sleeplessness, I would again insist that insomnia as an isolated disorder—simple insomnia—is a great rarity. Except occasional instances of habit-insomnia, loss of sleep is only one part of a symptom-complex. It is not rarely the one crying complaint which makes existence a burden, but investigation at once reveals the more or less perfect picture of hysteria or neurasthenia. The treatment of the symptom, then, is naturally the treatment of the neurosis. But here at once a sharp distinction must be drawn between two classes of cases; at least, in my opinion, this distinction should ever be clear in the mind of the physician, although it may be difficult to draw the line in individual instances. On the one hand, there is true nervous exhaustion: the overdrained, overstrained, otherwise normal nervous system that needs principally rest and replenishing; the person worn by work and worry, eaten by ambition or passion, prostrated by mental shock, who needs repose, diversion, nutrition. In the other class is found a nervous system, particularly a cerebral centre, naturally imperfect in many respects, ever in a state of unstable equilibrium, easily thrown out of balance, producing effects out of all proportion to cause. This is the individual of neuropathic temperament, the victim of his cerebrum. He may be for years apparently normal and is not unlikely to be brilliant in some respects, but to be possessed of an imperative conception seems to be his fate. He is usually self-centred, hypersensitive, and lacks perfect coordination of mental powers, the affective susceptibilities exceeding the reflective faculties. These persons are nearly all, at one time or another, insomniacs. Some of them are more: they are truly insomnomaniacs. These are the *zur Krankheit erwählten*

of Meynert, the chosen ones of disease, who most severely tax the physician's wisdom and patience. Among them alone is to be found insomnia as a psychotic equivalent—that is, taking the place of an attack of insanity. Here, too, hereditary insomnia must be sought, if it ever exist. I am inclined to think that so-called hereditary insomnia is frequently only habit-insomnia born of a hypersensitive nervous system, and, as is frequently the case with hysteria, fostered by the progenitors who transmitted the neurotic tendency.

Contemplating now these two classes of cases, it is at once apparent that they will need radically diverse treatment. The first calls for the rest cure in the simplest sense of the term, and little more. We have to do with a state of nutrition and function which is produced by a sufficient cause, and which, under favorable circumstances, we expect to be temporary. With proper precautions hypnotics and sedatives may be given with a free hand. In the second class we are confronted by a fundamental condition which may be, and generally is, as unalterable as the leopard's coat. Above all others these are the cases in which the individual is to be managed, and the disease, or at least the symptoms, neglected. To this class belong the neurasthenics whose trouble is started by a slight cause and continues to grow long after the cause ceases to exist. Such are laborers who have become permanently nervous after over-lifting; such are most of the cases of the so-called traumatic neuroses and post-operative nervous states. These patients are to be vigilantly protected from hypnotics and stimulants. The treatment must be essentially and continuously mental. The mind may be reached from many points, along numerous channels, but the objective point must be ever the same and always in view. Oftentimes these real unfortunates must be trained anew in ways of life and habits of thought. Instead of rest they should be given occupation, and instead of freedom from care gradually increasing responsibility; instead of drugs, personal influence and support. The development of self-discipline, self-control, hope, and confidence should be the constant aim, rather than day-by-day relief of dyspepsia, constipation, vertigo, or insomnia. A wide grasp of the subject, a buoyant courage, a ready tact—these, and not a prolific formulary, make the effective armamentarium.

As the personal equation is so prominent a factor in treatment, the medical interviews should not be too infrequent. The ordinary experience is that after seeing his physician the patient feels relieved and encouraged—as many of them express it, "lighter" in mind and body. But this exhilaration and improved tone are not enduring, and the patient needs anew his plunge into the fountain of recuperation. Unless the medical adviser can be truly such a source of inspiration he is not the ideal physician for these cases. For this reason, more

than any other, the practitioner who is really an enthusiastic and persistent electro-therapeutist, hydro-therapeutist, or dieto-therapeutist achieves brilliant results with his favorite treatment.

Perhaps the first thing to teach the true neurasthenic and the insomnomaniac alike is that they are not dying from want of sleep. Though the loss of sleep be very considerable, even sufficient to seriously impede recovery, it is well to reassure the patient. He will sleep better for it. The mere knowledge of insomnia and the anxiety it begets prevent sleep. But it is frequently wise to enforce this assurance and demonstrate to the patient that he can sleep by administering for a few days an adequate hypnotic. For this purpose full doses are advised. To begin with a large amount and diminish it is much better than to give at first small, tentative doses and be forced to increase them. The choice of drug is not of vital importance, but it should be one that has not already been taken and the patient should never know what it is. Personally, I like trional, about 20 grains, three-quarters of an hour before the sleeping-time, taken dry on the tongue and washed down with a cup of hot liquid. If the heart be perfectly competent, a full dose of chloral (30 grains) or of chloral and bromide is not objectionable. A good plan is to give 30 or 40 or even 60 grains of bromide three times a day. For this purpose sulphonal is not appropriate unless it is wished to prolong the effect of the somnifacient into the day. This is at times desirable. Occasionally the true neurasthenic, as well as the neuropathic insomniac, becomes frantic from worry and loss of sleep, and then to keep him for a few days drowsy and quiet is to start him on the way to recovery. To accomplish this sulphonal is well adapted, as it acts slowly and with prolonged effect. A single full dose (20 to 30 grains) with a glass of hot milk, at least two or three hours before bed-time, will often suffice. If not, a less amount (10 to 20 grains) in the morning will complete the effect. But such treatment is always a temporary expedient or an emergency resort. Milder measures alone are to be used continuously.

For the less aggravated cases, the moderate insomnia and slight neurasthenia of students and of professional and business men, simple changes in the habits of life are generally sufficient, provided they are conscientiously adhered to. A material shortening of the hours of work—that is, a definite curtailment for a definite or sufficient time; well-regulated and systematic out-door exercise; a cold morning sponge; proper diet; a quiet evening of humdrum conversation or light reading, followed by a hot bath and timely retiring, constitute the leading features of the treatment. In some persons a hot bath causes wakefulness. A brisk walk, exercise with Indian clubs, or pulley apparatus, followed by a cool bath, may then be substituted. Change

of climate is desirable, preferably not to an elevated region; but change is more important than altitude. It goes without saying that, as a rule, watering-places and much frequented resorts are to be avoided. For most cases of moderate exhaustion, life in the woods is an ideal treatment, but it will at once occur to every observer that for some neurotics, given to brooding or with a marked hypochondriacal tendency, seclusion may be the worst possible treatment. Cases that require much society, however, with constant diversion are much rarer than is generally supposed. Most of those thought to be such need systematic occupation.

When the loss of sleep is more considerable, the accompanying symptoms more distressing, and the general condition of the patient has suffered, something must be added to the foregoing regimen. Much is to be done before recourse is had to drugs. A full consideration of the broader measures that are useful in the insomnia of nervous people necessarily involves a discussion of the treatment of neurasthenia and hysteria. This is not my province, but a few general directions bearing especially on the symptom under discussion are considered to be in place.

For neurotics who are vigorous in body it is well to prescribe outdoor occupation, or a long rapid walk before bed-time, or even both. When true nervous exhaustion is present, physical fatigue is not to be recommended. For both classes, a reduction of disturbing noises to a minimum is desirable. In this connection the experiment of Strümpell, which has been repeated by others, is more than suggestive. A patient who was completely anæsthetic had lost the use of one eye and one ear. When the good eye was closed and the good ear occluded, that is, when all communication with the external world was cut off, the patient immediately went to sleep. This proceeding may be imitated to a slight degree in the case of hypersensitive persons by the use of antiphones. Of these the device of Rosenbach and that of Scripture are probably the best and simplest. The former consists of a thin tongue of cotton wadding about 6 by 3 cm. smeared with vaseline and rolled into a cylinder, the ends being slightly pinched in the process. This is introduced into the meatus to a depth of 2 or $2\frac{1}{2}$ cm., the protruding end is flattened out in the concha and covered with a layer of vaseline and cotton. The whole is removed in the morning and the meatus wiped out. The second-named author has successfully used plugs of soft sealing-wax (Dennison's American Express, No. 2). After warming the stick over a flame, a bit of sufficient size is pressed off by the thumb and forefinger and inserted warm and pliable into the external meatus. To make the adaptation more accurate the tragus is pressed over it for a moment, and for comfort the plug is then loosened a little at top and bottom by the index-finger.

That the insomniac is to retire and rise at regular hours goes without saying. The proper preparation for sleep has already been mentioned. In some instances change of the daily rectal evacuation from the morning to the evening is of assistance, the feeling of comfort and slight lassitude that follows defæcation conducing to slumber. In addition to what has been said of the sleeping apartment, I should like to insist upon the general advisability of single rooms and closed doors. More than once, in my experience, has removal of the wife or mother from a common chamber added one to three hours to her sleeping-time. Some neurasthenics and hysterics —generally those with partial or outspoken agoraphobia—cannot endure this nocturnal seclusion; a good many more say they cannot. For these latter a trial or two under the positive command and assurance of the physician will generally demonstrate the feasibility of the plan and materially hasten recovery. For the former, more refractory cases, a system of gradual removal must be followed, but I have never failed to accomplish it and to note the good effect. For the cases in which "imperative thinking" is the immediate obstacle to sleep one of the many monotonous mental pre-occupations may be of use. Thinking continuously of—

> "A flock of sheep that leisurely pass by,
> One after one; the sound of rain and bees,
> Murmuring; the fall of rivers, winds and seas,
> Smooth fields, white sheets of water, and pure skies."

Repeating prayers or poems over and over, the latter in the inverse order of the stanzas; recalling all the points of interest along a familiar journey, or the objects along a drive; reviewing all the characters in one of Dickens' novels or some other lengthy tale: these are a few examples. But this expedient is of little avail in cases other than those mentioned, in which one idea or conception constantly obtrudes itself.

As a sleep-producing ally, the value of *hydrotherapy* can scarcely be over-estimated. The theories as to the how and why of its good results in functional nervous disease are exceedingly elusive: the results themselves are sufficiently substantial and cannot be too emphatically insisted upon. Of the different hydriatric procedures none stands *facile princeps*. Even for an individual case the best may have to be determined by trial, and a change from one kind of application to another is often of advantage.

The masterly article by Dr. Simon Baruch in Volume I. of this SYSTEM is a model, and I have no desire to reiterate his valuable words, even in part. Nevertheless, a few direct hints from my own experience may not be entirely superfluous.

For the immediate induction of sleep the warm or hot bath is the most generally useful. The patient should be immersed to the neck, or at least to the axillæ, with a cold cloth or turban about the head, and the duration may be from ten minutes to one hour; the shorter time for prostrated cases, the longer for robust and very restless ones. I like to close the bath with a dash of cold water or a quick rub (ten seconds) with a cold sponge. But some patients are made more wakeful by the hot bath. For these the cool half-bath (see directions by Baruch), a tepid sponge, or warm douche should be tried. Occasionally a nervous, over-active man is wonderfully quieted by a cold sponge, douche, or shower, followed by vigorous rubbing. The wet pack (see article by Baruch) is perhaps quite as efficient a sedative as the hot bath. In states of extreme agitation I think it even more valuable, but for ordinary nervous persons the rather elaborate procedure is sometimes discomposing and defeats the object. The hot abdominal compress has received the highest praise as a somnifacient, as has also Chapman's spinal ice-bag. I have had no personal experience with them, and while not wishing to decry their inherent merit, I am inclined to attribute much of their virtue to the mental impression, exactly as in the case of the midnight placebo presently to be mentioned. In the general physical and mental treatment of the patient I esteem particularly the matutinal cold sponge, cold douche, or sheet rub. The winter season is a contraindication for none of these. The sponge should be brief and followed by vigorous friction, preferably by a second person. In the absence of special equipment for the douche, a couple of good-sized pitchers may be used and the water poured from a height over the back, chest, extremities, and occasionally the head also. A more pronounced effect may be attained by alternating hot and cold water. The sheet rub may be used for patients who are physically robust and for those who are so weak that they can scarcely stand while it is given. I prefer to call it a sheet rub rather than dripping sheet, because in my opinion the "rub" is a much more important factor than the "drip." To the directions given by Baruch I would venture to add the following suggestions:

I dispense with the tub of warm water for the patient to stand in, as it is unnecessary and interferes with quick work. The preparations are all made at the bedside or, if need be, in an adjoining bath-room. A pail or small tub half full of water, to which is added a handful of salt; a large, strong, dry sheet, gathered in folds lengthwise, and laid across the back of a chair so that it can be grasped at one end and spread out between the two hands in a twinkling; a similar sheet, similarly folded, dropped endwise into the pail of water, with the protruding gathered end resting on the edge of the pail or grasped in the

left hand of the attendant; two dry towels; a vigorous, intelligent attendant (two are better) with good "wind"—these are the provisions. The patient (quite nude) rises promptly from the warm bed, stands in front of the rubber with his back toward him and the arms flat along the sides. The latter quickly draws the sheet from the pail through the half-closed right hand, which frees it from superfluous water, grasps the right upper corner with the right hand and with almost one movement draws the two corners apart, so that the sheet hangs a suspended screen between himself and the patient, and throws it around the latter. The lower part of the sheet will not envelop the lower extremities perfectly, so the attendant quickly steps to the side or front of the patient, draws the edges more completely around and gets the upper corner over the shoulder, where a slap will fasten it. He then fleetly rubs the patient all over, rubbing simultaneously front and back, or right and left, with opposite hands. The wet sheet is then snatched off, the dry one substituted and the rubbing resumed. As soon as dry the patient gets into bed, and the feet are briskly rubbed for a moment with the dry towels and then smartly slapped until warm.

The whole procedure, except drying the feet, need not occupy more than one minute and a quarter—it must not consume more than two minutes; and if the rubber be not quite out of breath his work has not been properly done. Tepid or even warm water may be used for the first rub, but the temperature is to be lowered day by day until at the end of four to eight days it is quite cool or cold. The patient should *react at once* and feel a warm glow and general sense of comfort and well-being. Any shivering or depression after getting into bed is evidence of a defect in the administration of the treatment.

Among the more recent helps in general treatment kola may find a place. It should not be forgotten for a moment that it is only a temporary prop, not a true constructive, but it may enable the patient to take sufficient exercise and food for reconstruction. For instance, I have several times been able to get a weak and timid woman onto a wheel by means of the drug, when I could not without it. It is a cerebral exhilarant and I am unable to tell how much of its good effect is due to increased courage and confidence.

Passing again to the more direct treatment of insomnia, the timely administration of nourishment may first be mentioned. For many neurasthenics the evening meal seems to be insufficient fuel for the comparatively long interval between this repast and breakfast. A light meal at bed-time is a pleasant and efficient remedy for a large proportion of these. Any easily digested aliment is appropriate for this purpose; hot milk and dry bread, bouillon and crackers, hot

malted milk or malted meat, oyster-broth, raw oysters, koumyss, and matzoon may be mentioned. Some patients go to sleep with little trouble or with the assistance of one of the aids already noted, but awaken soon after midnight with a feeling of weakness and prostration, sometimes with absolute hunger; and perspiration is not rare. Under these circumstances the light meal is to be taken at this time. At either time the addition of a modicum of some alcoholic will aid in producing the desired effect. Hot milk-punch, beer, porter, mulled wine, hot toddy, a glass of sherry, are all available, but these adjuvants are always to be used with circumspection.

Quite a different class of poor sleepers regularly awaken at twelve or one or two o'clock, and then are unable to sleep for a longer or shorter interval. They are generally the neurotics—the hysterical or habit insomniacs. Each individual has his personal waking-time and observes it with considerable accuracy. To prescribe with minute detail and quiet assurance a placebo to be taken at the moment of waking is an easy means of bringing sleep to many of these patients. But the remedy must be ready at hand and taken promptly. If it be somewhat disagreeable, its efficacy is possibly enhanced, and the suggestion of Folsom, a small amount of paraldehyde in chloroform water, is a good one, or a little volatile oil dropped into hot water and inhaled may be used. I have employed a mixture of compound spirits of ether and tincture of nux vomica with excellent results. In this connection it may not be amiss to recall that deep and rather rapid respiration has of itself a tranquillizing effect, even to the extent of anæsthesia. If necessary, the placebo may be repeated several times in the night, but it must not be overworked. It is not to be supposed that all periodical wakers may be cured by this treatment. There are other causes for this type of insomnia (see Toxic Cases and Malaria), and this type of neurotic patient is affected with other kinds of insomnia.

It may not be entirely gratuitous to suggest that along with other organs the eye should receive adequate attention. That astigmatism, and probably eye-strain from other ocular defects, may cause sleeplessness is beyond doubt. It is equally true that the inability to sleep may be the only, or at least, the most obtrusive derangement due to the eye-trouble, but it is unlikely that such insomnia would occur in a healthy individual. Given a neurasthenic, the disturbing influence of an error of refraction may serve to prevent sleep, just as may the pulse in the ears or some trivial occurrence of the day that normally excites no reaction. The moral is obvious: Correct the ocular abnormity, but do not stop at that.

The proper place of *electricity* in the treatment of insomnia is still undetermined. That it is sometimes of assistance cannot be ques-

tioned, but in analyzing this result it seems impossible to tell how much is due to mental impression and how much to the effect of the current itself on the brain tissue. The obscurity of its *modus operandi* is no cause for rejecting it as a therapeutic agent. Of the three currents, the faradic, galvanic, and static, the first is, as a rule, to be rejected. Passage of the galvanic current from the forehead to the nape of the neck, or *vice versâ*, undoubtedly induces drowsiness in some persons, and they sleep the better for it. The electrodes should be very large and easily moulded to the parts, the current turned on and off gradually by means of a suitable rheostat, and its strength should not exceed 15 to 20 milliampères. I am in favor of rather lengthy sittings (ten to twenty minutes), prolonged if possible until there is a distinct feeling of drowsiness. The later in the day the application is made, the better. The static breeze or bath is somewhat more effective as a hypnotic than the galvanic current. It may be used every day for ten minutes, preferably in the afternoon or evening. Care should be taken to avoid the passage of sparks between the electrode and the head of the patient, as they are exceedingly disagreeable and the shock generally neutralizes the good produced by the breeze. The effect of electricity on sleep is largely a matter of experiment in each case, although in neurasthenia and hysteria it is well to assure the patient beforehand of good results; at least, to make a positive statement as to its benign influence in some cases. The writer feels it incumbent upon him to say, however, that careful observation and some few deliberate experiments on patients have forced him to the conclusion that the greater part of the sleep-producing effect of galvanism and the static breeze is due to their psychic effects—to suggestion, if that term be preferred. But, as before stated, that does not in the least militate against their employment if they will close the eyes of a sleep-wanting patient. Rather should it show that the means is always to be supplemented by the conduct of the physician, which need not be that of an unbalanced enthusiast, but such as will aid in tranquillizing and reassuring the sufferer.

Massage is one of the best non-medicinal inducers of sleep; but, like the hot bath, it occasionally causes wakefulness. The more skilfully it is given, and the more carefully it is adapted to the individual case, the more efficient it will be. To produce sleep, the treatment should be given late in the day, be not too vigorous, and embrace the whole body. If the patient fall asleep immediately on cessation of the manipulations such a nap is not to be discouraged, as it will tend to promote rather than impair the rest at night.

At this juncture, perhaps, some mention should be made of the vibrating helmet (*casque vibrant*) of Gilles de la Tourette. It is a metal helmet, easily adjusted to the head, and surmounted by a dimin-

utive electric motor, to which a small eccentric wheel is attached. The motor is run by a suitable battery, and the rapid revolution of the eccentric communicates a not unpleasant vibration to the helmet, and hence to the head. In my hands (and in the hands of others) it has proved to be of some assistance in relieving the distressing head-symptoms of neurasthenia and in promoting sleep.

Hypnotism should not be utterly discarded in the treatment of insomnia. Its field of usefulness is very restricted, but there is occasionally an hysterical patient, sleepless, nervous, agitated, perhaps apprehensive, whose stomach rejects drugs or in whom they act badly, who may be quickly tranquillized and put to sleep by this means. There are others who have already taken hypnotics to excess and cannot, or think they cannot, sleep without them. In these, hypnotism is of occasional assistance in tiding the patient over the difficult passage between abnormal and normal sleep habits. In any event, hypnotism is to be regarded, not as a system of treatment, but as an improvised stepping-stone to better things. It is always to be used simply, in a matter-of-fact way, without any assumption of mystery or peculiar power or personal influence. Employed with these common-sense precautions, I have never known it to do harm. To avoid any possible misapprehension I add, in so many words, my opinion that in scarcely one case of insomnia in a hundred is hypnotic treatment indicated; in the one-hundred-and-first case it may be the remedy *par excellence*.

The use of somnifacient drugs in the treatment of neurasthenia and hysteria is to be broadly condemned. Their employment is sometimes inevitable, but in the following, as well as the preceding, lines it is intended to point out their restrictions fully as definitely as their indications. In the administration of sleep-producing medicines three principles may be assumed as premises:

1. Never to resort to drugs until other measures have failed.

2. Other means having been exhausted, to be satisfied with the least amount of sleep compatible with health.

3. To use the smallest dose of the remedy that will accomplish the object.

Each of these propositions needs some comment and qualification.

In treating the almost absolute insomnia sometimes caused by great mental shock or moral perturbation, especially if it occur, as is apt to be the case, in a person with neuropathic tendency, it is inadvisable to lose time in an essay with milder remedies. Full doses of hypnotics should be given at once to conserve the vitality of the patient and avert possible mental alienation. This is one of the few instances in which insensibility is desired, even if it only remotely approach natural sleep. The best drugs for the purpose are chloral,

trional, sulphonal, or, if need be, the hypodermic injection of hydrobromate of hyoscine, $\frac{1}{100}$ of a grain. Sulphonal is well adapted to this purpose, as its action is prolonged through the day. It should always be given with hot milk and never too frequently. If trional or chloral is used, a full dose may be given shortly before bed-time and then supplemented by bromide during the day (20 to 60 grains t. i. d.).

The plan of giving comparatively large doses of hypnotics for a few days in ordinary neurasthenia, hysteria, or hypochondria has been already alluded to.

Insomnia of the puerperium, infection as a cause having been excluded, should be treated in the same vigorous manner.

In its practical application, the second proposition involves a knowledge of how much the patient sleeps, and, as before intimated, investigation may show, contrary to his belief, that the hours of slumber are but slightly curtailed. That is, the disorder of sleep is qualitative and not quantitative: a form of disorder that does not come under the head of insomnia and is not adapted to medicinal treatment. The less drugs are used in such cases the better. Supposing the duration of sleep to be unnaturally short, still, if the patient be reasonably recuperated, if by general treatment he can be made to gain ground on this presumably insufficient sleep, it is best to let drugs alone. Having been driven to the use of medicines, that the smallest useful amount is to be given would seem to go without saying. But I am well convinced that it is much better in the beginning to boldly give a thoroughly effective dose than to temporize with only partially efficient medication. This applies particularly to the insomnia of neurasthenia and hysteria, in which the psychic element plays such an important part. To administer in these troubles the rather customary 5 grains each of bromide and chloral three times daily would be absurd, if it were nothing more reprehensible.

Approaching now the symptomatic treatment of insomnia, let it be remembered first that, broadly speaking, symptomatic treatment is always a time-serving expedient or a contribution to euthanasia; and second, that there are several kinds of insomnia. It may be added that there is not a single hypnotic that for a long time can be effective, harmless, and without unpleasant by-effects. This implies that when the prolonged administration of hypnotics is unavoidable, a frequent change in the remedy is advisable. In every instance in which a single dose is given its administration should be so timed as to aid the organism when it is already moving sleepward.

For the insomnia of a too active mental state—for the man whose thoughts run riot when he wants to sleep, but who is not really nervously prostrated—bromide is probably the best remedy. It should

not be given in a single dose at bed-time, but in divided doses (15 to 60 grains each) through the day. The same treatment, modified, is applicable to the occasional patient who must be tided over a few days of great strain or excitement. In such emergency cases the bromide may be supplemented by a dose of kola in the morning and at noon (wine of coca answers the same purpose), and 20 to 30 grains of chloral or 15 to 20 grains of trional before bed-time. In the insomnia of an overworked brain, in addition to food and stimulants already alluded to, turpentine is often useful.

The habit, psychic, apprehension insomnia of the neuropathic individual is generally much easier to overcome than that of the true neurasthenic. The latter sometimes resists even heroic doses. An alcoholic stimulant or digitalis is then of advantage, combined with trional, sulphonal, paraldehyde, or chloral. Although sleep is more easily procured for the neuropath, the relief is much less likely to be lasting, and frequent changes and combinations of drugs are necessary. Chloral should be used but little, morphine never. Trional, paraldehyde, sulphonal, chloralose, chloralamid, are probably the best. Small doses of compound spirit of ether and chloroform, to be taken on waking at night, may be mentioned. Any of the drugs enumerated at the close of this section may be tried.

The selection of a remedy should be made somewhat with reference to the time of wakefulness. If the insomnia be distributed at shorter or longer periods throughout the night, a rather mild but continuous action is desirable. For this, bromides through the day, sulphonal two or three hours before bed-time, paraldehyde, trional, or chloral one-half hour before retiring, or chloralose at bed-time, may be used. Should the patient go to sleep with reasonable promptness but waken too early, it will usually be found that the hour of awaking varies but little. Administration of the remedy may be timed accordingly, and for this purpose sulphonal is admirably adapted. Given at bed-time, with an abundance of hot liquid, it begins to act in one and a half to two hours, and its maximum effect is reached in three or four hours. Taken with cold liquid its action is still longer deferred and slower, but less certain. The other hypnotics may be used for this type of insomnia, but the dose must be relatively large. When the difficulty lies in failure to fall asleep on retiring, the hypnotic must be given early: sulphonal four hours, the other drugs one to two hours, before bed-time.

On occasion, any of the following hypnotics may be employed, and it should be remembered that one may be successful when others have failed.

Trional, in doses of 10 to 30 grains, may be repeated every four hours until several doses are taken. Five-grain doses are sometimes

effective. It is almost tasteless, not very soluble, not a circulatory or respiratory depressant, and ill effects are quite infrequent. It may, however, cause nausea, vertigo, headache, slight inco-ordination, tinnitus aurium, and unpleasant diaphoresis.

Sulphonal is very sparingly soluble, even in hot fluids, and consequently acts very slowly. It should be administered in or with a glass of hot milk, which prevents the production of hæmatoporphyrinuria, otherwise sometimes caused by it. On account of its insolubility, prolonged action, and occasional unpleasant effects, frequent doses are to be avoided. Often a single dose every second day is sufficient. An uncomfortable heavy and dull feeling, unsteady gait, nausea or even vomiting, and headache are to be mentioned as possible after-effects.

Chloralamid, in doses of 20 to 50 grains, best given in acid solution, is an excellent soporific. It has the advantage of having a slightly anodyne action, and is thus useful in the late stage of sciatica, neuralgia, muscular rheumatism, etc., when the acute pain has subsided and only a nervous state with some local aching or soreness remains. It is not so reliable in its action as the two preceding drugs.

Paraldehyde, on account of its almost purely hypnotic effect, absence of danger, and minimum ill effects, is a desirable remedy. But the taste is so exceedingly disagreeable and the repulsive odor so clinging that most patients object to its use. It is, besides, an irritant to the respiratory tract. The dose is 20 minims to 1 drachm.

Chloralose is highly praised by those who have used it extensively. The sleep induced seems to be natural, and disagreeable sensations on waking the exception. In a few instances a large dose has caused rather alarming symptoms, the patient apparently going into collapse, but this has proved to be without danger and can be avoided by careful administration of the drug. Three grains may be given as an initial dose, and seven grains should not be exceeded.

Urethan (dose 10 to 20 grains) is a mild hypnotic, devoid of danger, with nothing in particular to commend it except that it may on occasion be used as a change.

Amyl-hydrate: A colorless oily liquid, of which the dose is from 30 minims to 1 drachm; the unpleasant sequelæ are trifling.

Somnal, hypnone, hypnal and chlorobrom have all been very successful in the hands of competent observers. The writer has had no personal experience with them. The first may be given in doses of 1 drachm to 100 grains, but it is apt to aggravate any existing gastric or intestinal trouble. The dose of the second is 1 drachm, and that of hypnal 15 grains. It is said that chlorobrom may be given for months without untoward effects. The dose is 2 drachms, to be gradually reduced or increased as necessity arises.

The Distresses of Sleep.

The disorders described under this title are not peculiar to hysteria and neurasthenia, but they are comparatively frequent as symptoms of these diseases and hence are here grouped together.

Dreams need no particular mention, except that they undoubtedly do, in exceptional cases, have a very considerable influence in the genesis and perpetuation of nervous states. This is most often demonstrable in cases of traumatic hysteria, or nervousness following a definite mental shock. The same intense dream, repeated over and over, makes an impression that is carried on into the waking state, although this influence may be subconscious—unnoticed by the patient. An interesting peculiarity of these visions, in such cases as are accompanied by hemianæsthesia and unilateral amblyopia, is that the figures and persons of the dream uniformly first appear on the side corresponding to the amblyopic eye, and pass across the visual field to disappear on the other side.

Night-terror is rare in adults. Mild cases are simply accentuated nightmare, with, perhaps, the element of somnambulism added. Typical cases, however, are something more, and seem to constitute a unique central neurosis. The only case that has come under the personal observation of the writer had resisted all manner of symptomatic treatment, but the patient was dissipated and good general measures were impossible. His attacks were nightly, and I took occasion to observe one. Without premonition, he sat up in bed (sometimes he would spring out of bed) with wide-open eyes and the most terror-stricken expression it has ever been my lot to see. At the same time he gripped the bed with both hands and gave utterance to the most piercing shrieks. The whole was unlike anything I have ever seen in an adult, but impressed me as being possibly a form of epilepsy. Bromide, however, gave no relief.

Muscular cramp is not rare in sleep, and, besides neurasthenia and hysteria, has a poly-pathologic basis. Among the causes may be mentioned physical fatigue, anæmia, the various toxæmias, arteriosclerosis, gout, rheumatism, diabetes, chronic nephritis, lithæmia, sciatica (especially the neurotic form), varicose veins, and convalescence from acute disease. The treatment must be that of the causative condition : for the neurotic form, full doses of bromide. Immediate relief of the cramp is best obtained by stepping at once onto a piece of cold oil-cloth or sheet-iron.

Nocturnal pruritus may be a very trying plague. Besides diathetic treatment, chloride of calcium, 20 to 30 grains, well diluted, two or three times a day after meals, should be tried. For nocturnal burning of the feet a rubber bag of ice-water is worthy of trial.

The subject of painful awakening is treated in the following section, although the disturbance is apparently caused, in many instances, by some distressing impression received or developed in sleep. A consideration of night-palsy or night-numbness has also been transferred to that section, although the condition undoubtedly develops before the patient awakes.

Disorders of Sleep Peculiar to the Transition State between Waking and Sleeping.

Nervous disturbances restricted to the time between the waking and sleeping states—the *pre-dormitium* and *post-dormitium* of Weir Mitchell—belong especially to neurasthenia and hysteria, without being confined to them.

In the quiet moments before sleep comes, many sensations that are imperceptible or easily neglected during the day obtrude themselves on consciousness. Tinnitus aurium and the aural pulse are among the most frequent of these. An intense appreciation of the presence of the extremities or of the internal organs is a daily complaint. Visual sensations that are only an accentuation of the play of colors that any person can see on closing the eyes, annoy other patients. Muscular starts at the moment of dropping off, a sensation as though the head were expanding, a feeling of bodily weight as of lead, or of gaseous lightness, are common. If the last be a little more pronounced the patient feels as if he were floating off into space or as if the bed were sinking from under him. Probably every normal person has experienced, now and again, an inconsiderable jerk or start just as sleep supervenes. The aggravation of this almost normal lapse of nature constitutes the most frequent and one of the most distressing neuroses connected with sleep. The starts may be exceedingly violent, and repeated as many as twenty or thirty times. As the patient starts awake he frequently has an overpowering sense of alarm or apprehension which materially adds to the discomfort of the trouble. Presenting some analogy to the sudden motor discharges (which may attain to even a violent degree) are what I would call psychic starts. The patient is just losing himself when he suddenly regains vivid consciousness with an impression of impending death or simply an intense feeling of apprehension. A similar disturbance is later described as pertaining to the post-dormitium, while imperative conceptions and fixed ideas as sleep preventives have already been mentioned. Akin to these are presomnic hallucinations, which are not rare, as every healthy adult can probably recall instances in his own experience. They are even said to be, at times, a family trait, but are nevertheless of importance as a possible indication of intoxication by alcohol or tobacco or of an incipient psychosis.

These hallucinations are quite distinct from certain sensory discharges or sudden and distressing subjective sensations that have a predilection for the same antedormal state. They appertain most frequently to the auditory sphere, but may relate to any other of the special senses, to several combined, or to none specifically. Two examples will illustrate: A gentleman of twenty-nine, a typical neurasthenic from neuropathic heredity and prolonged worry, was just falling asleep when he was startled by an apparent explosion in his head. He insists that there was a coincident flash of light, and that the explosion was exactly like the discharge of a pistol—and in the head, not near by. The phenomenon frightened him exceedingly; he started up in bed and it was some minutes before he could again compose himself. The attack was not repeated.

A lady of forty years, nervously and physically exhausted by manifold cares added to a nervous disposition, was seated, preparing for bed, when, so far as her sensation was concerned, she received a crushing blow on the back of the head. With a cry she sank to the floor, did not lose consciousness, but immediately felt a peculiar, subjective vertigo. Her husband picked her up and placed her in bed, where she found that she could lie only on the left side, any attempt to change this position resulting in the indescribable cephalic distress that seemed to be more like vertigo than anything else. About thirty minutes later I found her lying upon the left side, quiet and comfortable, but very apprehensive. She was positive that should she turn over the disagreeable sensation in the head would return. After a few moments, however, she slowly did so without discomfort. A most careful examination failed to reveal any grounds for supposing the presence of an organic lesion. She has since then (seven years) had no return of the violent stroke, but what she now calls the "silent whirr" is very apt to be felt when she is tired out. It will be noticed that the sensory shock, in this instance, did not take place, strictly speaking, in the pre-dormitium, although the subsequent slighter manifestations have been practically confined to that time. As a matter of fact the symptom may occur during the day, though it rarely does so.

Sometimes the sensation is likened to the sound of a gong or the twang of a harp-string, and when the attacks become habitual there is not rarely an aura, in which case the patient may be able to abort the attack by turning over or sitting up as soon as the aura gives him warning. It is characteristic of the somnolent state during which these peculiar symptoms generally arise, that the patients find great difficulty in thus breaking in on the attack and jugulating it. But this ability may be and should be acquired by practice, and the idea should even be cultivated during the day, to make its execution at

night the easier, for systematic interruption of the train of symptoms is one of the best cures.

Disturbed awakings are of various kinds. Many poor sleepers, and many nervous or worried persons who sleep well, awake unrefreshed and complain that they are more fatigued than when they retired.

Separate mention should be made of a particularly distressing group of sensations that are felt on waking—and probably cause the cessation of sleep—as they are not infrequently mistaken for an indication of organic disease or of nocturnal epilepsy. The patient regains consciousness rather suddenly, with a sense of oppression and impending danger, accompanied by palpitation, præcordial distress, cold perspiration, and a feeling of trembling which may be local or generalized. One or more of these separate elements may be absent. Patients, as a rule, mention a shaking or quivering, but in my experience investigation has generally shown the symptom to be purely subjective. This painful waking is apt to occur very early in the morning (two to four o'clock), and it should be said that the patient usually has no knowledge of nightmare or a horrifying dream as producing it, although it is not unlikely that such cause or accompaniment is present. So far as I am able to judge, the symptom is more frequent in neuroses due to injury or shock. For instance, of five cases seen recently, two were directly referable to fear of hydrophobia, following dog-bite; one followed an operation on the perineum and vagina; one was caused by a street-car accident; and the last, the exception to the rule, occurred in a young married man who worried incessantly because he was out of work and money. Freud has written of these agitated awakings as a part of his "anxiety neurosis," the etiology of which he believes is always to be found in some sexual irregularity, but the symptom certainly is not confined to neuroses of this origin.

Quite a distinct set of symptoms has been variously described as nocturnal hemiplegia, night-numbness, night-palsy, nocturnal monoplegia, and sleep-pain. The character of the trouble is sufficiently well indicated by the titles. The patient awakes to find himself the victim of a tingling and numbness (sometimes rather a pain) associated or not with transient loss of power. As described by Ormerod the disturbance attacks predominantly the upper extremities, affects principally women at the menopause, and in particular needle-women, scrubbers, and others who labor with the hands. This is the common type. The symptom may appear in persons hemiplegic from cerebral apoplexy and be confined to the paralytic side. But apparently vigorous subjects are not exempt, and its distribution is governed by no known rule. A peculiar form is that which affects the legs from the feet to the knees, is not a distinct pain but rather an acute distress, and begets an imperious desire to move and stamp the feet. Although it

generally occurs in sleep and may waken the patient several times in the night I have known it to be almost confined to the pre-dormitium.

True night-palsy and night-numbness are important largely on account of their innocuousness. Occurring in the subject of organic hemiplegia, or indeed in any person, they are certain to awaken apprehension of apoplexy or other paralysis, and it is no trifling matter to be able to give assurance of their benign character—unpleasant though they be. But such reassurance should be given only after a positive diagnosis and the careful exclusion of organic disease. The symptom may occur as a prodrome of multiple neuritis, preceding the pain by several days. A verisimilitude of the hemiplegic or monoplegic form may be presented by the sensory type of Jacksonian epilepsy, which consists of transitory numbness, tingling or other paræsthesia, followed or not by weakness of the affected part, but unaccompanied by spasm. Such attacks of focal epilepsy are due to organic brain-disease, and may, of course, occur at night, but I have never known of a case in which they were only nocturnal.

Weir Mitchell relates the instructive case of a physician who, being himself a sufferer from the functional form of nocturnal hemiplegia, confidently assured a patient who came to him with waking numbness that the trouble was nothing serious. The latter, unfortunately, was diabetic and his attacks of paræsthesia were the precursor of gangrene.

Transitory attacks of numbness, with or without weakness, are not infrequently due to degeneration of the arteries of the brain, and are well known as premonitory signs of cerebral thrombosis. I have known night-numbness of the legs to be closely simulated by syphilitic periostitis of both tibiæ, and an uncontrollable restlessness of the lower extremities, manifested especially after retiring, is not so very rare in locomotor ataxia and paralysis agitans.

The symptomatic treatment of these disorders connected with going to sleep and waking is not very successful, although full doses of bromide of sodium or potassium are almost a specific for the predormal starts, and will often relieve the other disturbances. For these, as for other derangements, the bromide should be given three times daily. Occasionally, hypnotics to enable the patient to sleep promptly and soundly are of some assistance, but the chief reliance must be placed on general treatment. When they are due to the toxæmia of intestinal derangement, lithæmia, gout, alcohol, or tobacco, which is not rarely the case, permanent removal of the intoxicant affords relief.

DISORDERS OF SLEEP IN MENTAL DISEASE.

Among the insane, by far the most important disorder of sleep is the lack of it. The numerous illusions and hallucinations born of sleep and the night, and the delusions to which they give rise, need not be considered here.

Respecting insomnia as a cause of insanity, an opinion has already been expressed. The possibility need not be denied, neither is there any reason why a neurasthenic insomniac may not become insane, but that the insomnia plays an important rôle in the causation is highly improbable. In fact, the majority of such cases will be found to have been examples of psychic alienation from the first, and the caution not to mistake an incipient psychosis for "nervous prostration" cannot be too often repeated. In some instances the insomnolence seems to be the only symptom of note until a sudden tragedy awakens friends and physician to the fact that a grave condition has been overlooked. This is not the place to consider the differential diagnosis between insanity and neurasthenia, but it may not be amiss to say that when the patient exhibits marked *tedium vitæ*, loss of interest in usually engaging subjects, and lack of affection for beloved relatives, especially if he be non-communicative and court solitude, melancholia should be strongly suspected. The appearance of any form of delusion, of very extravagant conduct, or of a few unmistakable somatic signs, takes the case at once out of the realm of nervous prostration. Marked insomnia without apparent cause or appearing and disappearing without relation to other symptoms, particularly in a person with an hereditary tendency to insanity, should put the observer on his guard.

The proper treatment of the insomnia of insanity is a vexed question, but it will be conceded at once that in its incipiency it should receive prompt and careful attention. Although, in my opinion, the wakefulness cannot be regarded as preceding the psychosis, but is rather to be considered as an early manifestation of the disease itself, yet the symptomatic treatment of the insomnia may be thoroughly successful because it is, incidentally, the best treatment for the mental state. To illustrate: We eat, symptomatically, to quiet hunger; physiologically, we eat to provide material for bodily repair and growth: we know that this material has been furnished when hunger ceases, when the appetite sleeps. In other words, if, in this early stage, a sufficiency of refreshing sleep may be procured the attack of insanity may be averted or checked in its inception. The best means of attaining this end may require a nice judgment. All of the general aids enumerated as of value in neurasthenia are applicable here. Particularly are a sufficiency of out-door exercise and appropriate food, quiet seclusion, the

hot bath and wet pack, to be commended. Of the soporific drugs, trional, sulphonal, chloral, paraldehyde, or one of the others already enumerated may be used—never forgetting that chloral is a cardiac depressant. In incipient or mild melancholia I do not hesitate to give opium, and although the results are not always gratifying I find it one of the best drugs for this disease, and in doses up to 3 grains three times a day have never seen any ill effects from it. It should ordinarily be withdrawn gradually, although in a few instances stopping it abruptly and substituting full doses of bromide, as is done in the Flechsig treatment of epilepsy, has occasioned only good results.

In severer cases of melancholia, in acute mania, the excited stage of general paralysis, and the like, it is difficult to determine to what extent sedatives should be used. There can be no doubt that a few full doses in the beginning sometimes accomplish a great good. For acute mania the hypodermic administration of $\frac{1}{100}$ grain, or even $\frac{1}{50}$ grain, of the hydrobromate of hyoscine is probably the best remedy, but it has a depressing action on the heart. The same may be used in the other psychoses, although it has no special advantage and sulphonal, trional, paraldehyde, and chloral are better; the bromides, even in drachm doses, have but little effect. Later the dosage should be regulated by its effect. Insensibility is not sleep, and the condition of the patient before and after the action of the soporific should be carefully compared. Sometimes he is better off to lie awake for days together than to take the doses of medicine necessary to force him into unconsciousness. Neither should it be forgotten that even when a sedative drug causes no perceptible impairment of the vitality, no depression of the circulation or respiration, no derangement of digestion, it may still produce considerable mental depression. In spite of the prospect of a restless night the patient will sometimes request that the sleeping-powder be omitted on account of the oppression of spirits following its use.

The employment of hypnotics in insanity may be broadly summarized as follows: Early in the disease they may be given rather freely, later with caution, and in the last stages, whether of decadence or convalescence, they should be entirely withdrawn in favor of more general measures.

DISORDERS OF SLEEP FROM INTOXICATION.

Alcohol and tobacco are the principal intoxicants producing disorders of sleep, although similar derangements may be caused by lead, mercury, bisulphide of carbon, tea, coffee, and the various drug-habits. The auto-intoxication of disease is separately considered.

Loss of sleep, or disturbed sleep, is frequently the first symptom of alcoholism. Terrifying dreams, or hallucinations at the moment of falling asleep, are well known as belonging to the early stage of delirium tremens. Of the fully developed affection, wakefulness is a prominent symptom and as soon as the patient can sleep and eat convalescence may be considered as inaugurated. In cases of only moderate severity, full doses of bromide (30 to 60 grains) with nux vomica, three times daily, may be quite sufficient to induce sleep and avert a serious attack. But even in the mildest cases the state of the heart must be accurately known, as sudden cardiac failure is always possible. The graver the case, the more urgent is the precaution, and no hypnotic is to be employed at the expense of the patient's powers. For this reason large doses of chloral are rarely indicated. Trional, paraldehyde, chloralamid or sulphonal are preferable. Even with these it is often advantageous to combine strychnine, digitalis, or nitro-glycerin. In delirium tremens, as in the severer cases of insanity, it is sometimes wiser to allow the patient to go without sleep than to give him the heroic doses necessary to compel it.

Treatment of the insomnia of chronic alcoholism, unattended by delirium, means the treatment of the vicious habit, but temporary relief is not difficult. Bromide and strychnine three times a day, trional, and sulphonal act well. The addition of capsicum to the hypnotic and to animal food given at bed-time is of advantage. It is well to remember that a gastric mucous membrane coated with viscid secretion and accustomed to the irritation of raw spirits may be only agreeably stimulated by a dose of red pepper that would be instantly rejected by a more sensitive stomach.

Tobacco is not only a frequent cause of insomnia, but is one of the most influential factors in the production of disturbances peculiar to falling asleep and awaking. The insomnia of tobacco (and also that of alcohol) is apt to take the form of early waking, but not quite so early as that of the neurotic individual before described. The latter usually comes on soon after midnight, toxic insomnia about two hours later, although there is nothing absolute about this rule. At any rate, in every case of insomnia, whatever the type, tobacco should be thought of as a possible cause. The treatment is simple and uniformly successful; withdrawal of the cause, full doses of strychnine, and mild hypnotics for a time. Hot toddy at bed-time is an efficient aid, but should be used with care lest one bad habit be substituted for another.

It may be noted that insomnia and other nervous symptoms of an intoxicant may appear only when the individual has interrupted its use because of conscientious scruples or some bodily indisposition, has become neurasthenic from other causes, or has sustained some physi-

cal injury from accident or disease. Under these circumstances the toxic agent as an important part of the etiology is often overlooked.

DISORDERS OF SLEEP IN ACUTE DISEASE.

The treatment of insomnia in acute disease must rest upon the principles already indicated. The best treatment of the sleeplessness is always the treatment of the disease. Although sleep is the great restorer, and is to be procured whenever expedient, it is not to be forced upon the patient at the expense of his vitality. In dealing with acute diseases, which are nearly all self-limited, the formation of drug-habits and the acquisition of drug-tolerance are not primary considerations. The question of cardiac and respiratory depression is of vital importance. In the early stage of pneumonia, for instance, when the pulse is strong and the patient vigorous, persistent insomnia may be overcome by venesection or aconite. If preferred, trional, chloral, or sufficient doses of morphine may be given, all to the permanent benefit of the patient. But in a later stage, when the patient is exhausted, the pulse flagging, and the respiratory centre necessarily kept up to the highest possible activity, a depressant of any kind would mean death. At such a time, chloral and opium are to be classed with venesection and aconite and religiously avoided. Trional, chloralamid and paraldehyde are not so objectionable, but are to be used with extreme caution. Digitalis, strychnine, alcoholic stimulants, are the remedies indicated to induce sleep. For the wakefulness of pleurisy, morphine and aspiration are probably the best remedies.

The insomnia of typhoid fever is deserving of grave consideration, and the medical attendant should always know when and to what extent wakefulness is present. Early in the disease it undermines the vitality and makes the subject less resistant to the later drains of the disease. In the advanced stages it exhausts the patient, and may prevent enough daily recuperation to keep him alive. Incomparably the best treatment, for all stages alike, is hydrotherapy in one of the several forms so well described by Dr. Baruch in Volume I. of this System. But reduction of temperature is not always followed by sleep, and the insomnia then demands symptomatic treatment. During the first week, or before secondary infection, bromide may be given in full doses or, what is better, chloral hydrate, which at this time is not objectionable and is generally effective. Trional, sulphonal, chloralamid, may be tried but are rather uncertain; opium is to be avoided. Later in the disease trional and similar remedies are more reliable than in the beginning, and codeine ($\frac{1}{4}$ to $\frac{1}{2}$ grain) is an excellent hypnotic,

but the best of all at this time is opium or morphine, which is sometimes greatly increased in its action by the addition of $\frac{1}{150}$ to $\frac{1}{100}$ grain of hydrobromate of hyoscine. When prostration is very great the free administration of stimulants is of value, and a hypodermic injection of sulphuric ether has been known to procure refreshing sleep when all else failed.

The treatment of insomnia in other acute diseases may be gathered from the following: in articular rheumatism, antipyrin and Dover's powder; in influenza, phenacetin or sulphonal; in the early stages of the exanthemata, antipyretics, trional, or other pure hypnotics, in the late stages $\frac{1}{5}$-grain doses of morphine unless voluntary effort is needed to keep the respiratory tract clear of mucus and saliva; for the vigil of meningitis, cold to the head and morphine, although full doses of trional may suffice. These are additional hints possibly worthy of mention.

In this connection insomnia of the puerperium may be mentioned. If marked and not due merely to prostration or loss of blood, it is of grave import, as it then indicates either infection or impending puerperal insanity—possibly both. When accompanied by a feeling of well-being or exhilaration it is none the less foreboding. Infection having been excluded or properly treated, hypnotics may be administered even in large doses, for a short time. For this purpose sulphonal, trional, chloralamid, or full doses (1 drachm) of bromide may be used, and there are no objections to chloral (20 grains), or even morphine with atropine hypodermically, if necessary. When the wakefulness is due simply to the excitement attending parturition, as is not rarely the case with primiparæ, any mild hypnotic will answer the purpose. For the insomnia of prostration or acute anæmia the frequent administration of liquids, light food, and small quantities of stimulants is indicated. Half a drachm of Hoffman's anodyne in ice-water is an excellent remedy.

For the insomnia of convalescence treatment is practically that of anæmia and chlorosis: plenty of easily digested, nutritious food, mild alcoholic drinks in moderation, iron, strychnine, quinine, and other tonics are the best remedies. There is no objection to moderate doses of hypnotics if the heart and digestion do not suffer thereby. Trional, sulphonal, urethran, chloralamid, and compound spirits of ether may be mentioned. Ten grains of quinine at bedtime followed by whiskey in hot water is an excellent remedy, or Warburg's tincture may be tried without the whiskey.

DISORDERS OF SLEEP IN CHRONIC DISEASE.

THERE is scarcely a chronic disease that does not cause disorders of sleep, and in every instance the ideal treatment of the insomnia is the successful treatment of the causative disease. It would, therefore, be utterly futile to attempt a systematic discussion of the subject in this connection, and what follows is to be considered in the light of suggestions only.

Of 273 cases of insomnia in the practice of MacFarlane and two friends, 17, or one in sixteen, were due to "dyspepsia." If all forms of gastro-intestinal disease were taken into consideration this ratio would probably be greatly increased. However that may be, it is certain that insomnia or some other disorder of sleep may be a symptom of every variety of digestive derangement. It is equally true that loss of sleep not infrequently has a reciprocal action for evil on the digestive function, and that if the patient can be made to sleep, or taught to sleep, the trouble in the gastro-intestinal tract at once improves. There seems to be no doubt that protracted insomnia may be caused by indigestion without other signs of a deranged stomach. Some of the cases of apparently simple sleeplessness are, I am convinced, due to intestinal auto-intoxication, while others have a twofold etiology—reflex disturbance from the stomach with the toxæmia added. Besides loss of sleep, abnormal somnolence, nightmare, muscular starts, and painful awakings are at times referable to disordered gastro-intestinal functions. Regulation of the diet, particularly a light, easily-digested evening meal, intestinal antisepsis, and good personal hygiene will generally overcome the difficulty. When there is undoubted irritation of the gastric mucous membrane cocaine may be given for temporary relief. Not infrequently mild hypnotics may be required to break up the vicious sleep-habit.

Lithæmia, chronic rheumatism, and gout are prolific causes of sleep-disorders. The first especially is of importance, as it is so frequently unrecognized, and insomnia or any one of the other forms of disturbed sleep described under Neurasthenia and Hysteria may be the only symptom to which the patient calls the physician's attention. Even the ordinary gastric trouble and headache may be wanting. The wakefulness of lithæmia, like that of other toxæmias, affects especially the early morning hours. When the patient wakes at this time, a drachm each of Carlsbad salts and syrup of ginger in water will often produce immediate sleep. Dependence must be placed, however, on more general treatment. Restriction of meat and fats, with abundance of physical exercise, Turkish baths, mercurial and saline purges, enter into the accepted routine. Salicylate of sodium and muriate of ammonium are to be highly commended. When there

is increased arterial tension potassium iodide, alkalies, and aconite are advisable. Lithæmia and gout play an important rôle in the "night-numbness" already described, and some cases are entirely cured by the measuress just indicated.

It were unnecessary to say that manifold disorders of sleep may be caused by Bright's disease and diabetes, did they not occasionally constitute the only notable symptom and thus mislead the diagnostician. The possibility of such an oversight needs but to be mentioned to be avoided. For the insomnia of chronic nephritis chloral is particularly good, as it causes dilatation of the vessels and so lowers arterial tension. Its action is enhanced by the addition of bromide and morphine. In the renal disease of the aged, nothing controls the insomnia so well as opium.

In any consideration of the disorders of sleep due to disease of the circulatory system, the first statement to be made is that such disorders are never to be referred to "anæmia of the brain" and "congestion of the brain" in the sense in which these terms are most frequently used. That is, they are not due to changes in the cerebral circulation as an essential condition—as a morbid entity. The insomnia following severe hæmorrhage is dependent on cerebral anæmia as a part of the general condition. The nightmare of mitral disease may be due to the overfilling of the cerebral veins, but this is not the supposititious condition usually indicated by the term "cerebral congestion." Above all, disorders of sleep are not caused by "congestion of the base of the brain," for the simple reason that such a condition does not exist, except possibly in the first stage of basilar meningitis.

Some patients are awakened in the night by violent palpitation. This may be purely nervous, may be caused by a distended stomach, or may depend on organic heart-disease. For all alike, a cold compress or an ice-coil to the præcordium is a good palliative. In some cases of cardiac disease not sufficiently severe to cause insomnia, the patient is troubled with nightmare or terrifying dreams unless a certain posture be maintained.

It is worthy of note that insomnia, with possibly some other nervous symptoms, may be the only manifestation of fatty heart. Ordinarily, however, although the patient may in no way complain of the heart, there is a history of irritable temper, occasional weakness, dizziness on exertion, cold feet, disagreeable dreams, and perhaps nocturnal dyspnœa. For this condition digitalis, strychnine, arsenic, and an occasional dose of morphine are indicated. Chloral is to be shunned as dangerous.

For the insomnia of valvular disease, bromide may be given when there is compensatory hypertrophy. When dilatation has supervened, digitalis and similar drugs, diffusible stimulants, nitro-glycerin, nitrite

of sodium, etc., must be depended upon. For præcordial distress, the ice-coil or dry cups. In some cases, unloading the circulation by venesection will relieve the heart and allow of refreshing sleep. When the cardiac power is fairly good, opium may be cautiously given and sometimes acts like a charm. If orthopnœa be present, hypnotics are out of the question. In all cases the amount of urea excreted should be estimated; if found deficient, free purgation may at once relieve the symptoms.

In chronic respiratory affections, insomnia and other disorders of sleep are due to cough, passive congestion, fever, or the accompanying anæmia and digestive disturbance. The treatment must be directed accordingly. Occasionally, purely symptomatic therapy must be added and then trional seems to answer the purpose remarkably well. It may be necessary to give codeine or small doses of morphine. The hectic fever of phthisis may often keep the patient awake, and then antipyrin or other antipyretic will hasten the sleep that comes with the morning defervescence. In old cases of emphysema, when there is considerable venous stasis, the treatment should be that of the insomnia of heart-disease: semi-recumbent position, heart tonics, and stimulants. In the chronic pulmonary affections of old people, opium, cautiously used, is the best remedy.

That malaria may cause wakefulness without chills or fever, or after these more violent manifestations have been subdued, needs simply to be mentioned. This seems to apply particularly to children. Such insomnia is very apt to pertain to the early morning hours, like that of the other intoxications. The treatment, of course, embraces quinine and arsenic.

Diseases of the nervous system, organic and functional, cause, in the majority of cases, some disorder of sleep, but these symptoms scarcely merit extended consideration in this connection.

It is worthy of note, however, that the insomnia and other sleep-abnormalities of the aged are generally due to changes in the cerebral arteries and consequently in the nutrition of the brain. Sometimes there is increased somnolence instead of wakefulness. These disorders are frequent after cerebral hæmorrhage or thrombosis, and indeed are not rarely premonitory of the latter lesion. The best treatment is the administration of light food (koumyss and matzoon are excellent) with a mild alcoholic stimulant, preferably hot, at bed-time. Strychnine, strophanthus, and nitro-glycerine given through the day may be added.

Insomnia is not infrequently one of the early symptoms of organic brain-disease, as tumor, abscess, meningitis. To the same category probably belongs the insomnia of syphilis that is unaccompanied by pain or any other evidence of brain disease. Such cases occur, but it

is reasonable to suppose that the brain is affected, either by a toxic agent or through alterations in the vessels. That gross brain-syphilis may cause insomnia as well as somnolence is well known, and the cure by active treatment is always prompt.

In paralysis agitans patients often complain bitterly of inability to fall asleep on account of muscular unrest, which I think is a part of the ever-present muscular rigidity of this disease. They cannot assume a comfortable position and are absolutely unable to procure the relaxation and bodily repose necessary to slumber. Duboisine is probably the best remedy for this, but like hyoscine, which is also useful, loses its efficacy after a time. Rather prolonged hot baths at bed-time, the hot pack, massage, trional, paraldehyde, and sulphonal are worthy of trial. Strong faradism, sufficiently vigorous to cause tetanization of the muscles, is at times a great relief, and the short relaxation, or feeling of relaxation, following the treatment may enable the patient to fall asleep.

The subjects of exophthalmic goitre are often kept awake by tachycardia, the violence of the cardiac impulse, and throbbing arteries. For this difficulty 20 to 30 drops of laudanum in some demulcent, by the rectum, is the surest remedy, but, unfortunately, it cannot be employed often for fear of engendering an appetite for the drug.

DISORDERS OF SLEEP IN INFANCY AND CHILDHOOD.

The healthy new-born babe sleeps constantly, except when taking nourishment. At six months, the child should sleep fifteen hours; at one year, twelve hours; from one to four, ten hours; and up to the eleventh or twelfth year, at least nine hours. At the time of puberty both sexes should have an abundance of sleep, as it is a critical period, the time to avert functional nervous trouble, especially migraine, and to fix a good sleep-habit. It is a solemn duty of the physician to caution parents against giving children too little sleep. Many persons, regarding the number of hours of sleep as a mere matter of habit and of no particular importance, allow children to retire late, and then, for convenience or on principle, get them up early in the morning. The habit of going to sleep readily, sleeping sufficiently, and waking promptly should be, and can be, early inculcated.

Persistent insomnia in infancy and childhood is rare, and should at once awaken suspicion of acute infectious disease or some cerebral affection. Restless and broken sleep is common as a result of vicious education or of disease. There are, however, some perfectly healthy

children who exhibit great bodily unrest in sleep. Rickets is a frequent cause of insomnia in children, as is also congenital syphilis—even when other signs of the disease are slight or wanting. Any disturbance of the gastro-intestinal tract, from thrush to ascarides of the rectum, may cause disordered sleep, and it should not be forgotten that infants are not rarely kept awake simply by hunger and thirst. Not only must the quantity of milk (or its substitute) be adequate, but the quality must be sufficiently good.

For the wakefulness of the acute fevers nothing compares with the free use of cold water externally and internally, although in the early stages trional and in the late stages alcohol are of distinct advantage.

Night-terror—*pavor nocturnus*—is almost confined to childhood and constitutes a reasonably distinct neurosis. Some attacks are doubtless simply examples of nightmare caused by errors in diet, and others approximate mild somnambulism with visions of people and objects. Still others are to be classed as juvenile hysteria. Adenoid vegetations are responsible for a considerable number of nocturnal nervous attacks in children. But beside all these there remains a tolerably definite paroxysm still to be accounted for. This comes on ordinarily an hour or two after the child has fallen asleep—suddenly, in the midst of quiet slumber—and occurs but once in the same night. With eyes wide open the little patient screams with terror, evidently has visual hallucinations of a frightful character, and does not recognize persons, although he will often cling to them in his fright. The attack is generally of very short duration, but the child may be nervous and timid for some time afterward. The more the disturbance varies from this type the more likely is it due to some reflex or ascertainable cause, although no sharp dividing-line can be drawn either through the character of the attacks or their etiology. Still a distinction should be made, for night-terror due to an overloaded stomach, a fright, or adenoids in the naso-pharynx is a much less serious affair than the same affection dependent upon a defective brain—the neuropathic constitution. This latter class seems to approach dangerously near to epilepsy.

The appropriate treatment is almost indicated by what has just been said. Every possible source of reflex excitation is to be sought out and removed. Rickets especially is to be carefully excluded, or, if found, properly treated. The evening meal is to be light, and all unnatural excitement, startling tales, and disciplinary threats rigorously avoided. These details having been attended to, should the attacks continue, and particularly should the patient have slight dizzy attacks or brief "absences" during the day, vigorous measures are to be adopted. The case is then to be treated as one of incipient epilepsy

and the convulsive habit forestalled at once, if possible. Expense, convenience, and (in older children) school education are not to be considered. An absolutely perfect mental and physical hygiene is to be insisted upon, and, in addition, adequate doses of sedatives are to be administered. Bromide, alone or in combination with conium, belladonna, or cannabis indica, is probably the best, although sometimes full doses of trional and sulphonal for a short period will break up the habit. In a very refractory case I should not hesitate to use the Flechsig treatment of epilepsy. I might add that occasionally a strong mental suggestion by means of a sharp physical impression (the parental hand to the buttocks, a cold douche—or the threat of it) has served to cure the disorder; but such means are generally futile. The best remedies for nocturnal enuresis are almost complete abstinence from liquids after four or five o'clock, elevation of the foot of the bed, the cold spinal douche at bed-time, belladonna, and rhus aromatica. It may be necessary to systematically waken the child an hour or two after the beginning of sleep, so that he may evacuate the bladder. It should not be forgotten that the trouble may be due to some removable condition, as too acid urine, vesical calculus, an abnormal prepuce, rectal irritation, etc., or to an abnormally small bladder. In a great many cases nocturnal incontinence is a stigma of neurotic degeneracy.

The insomnia of chorea is controlled by chloral or trional, and children can take relatively large doses of either drug. For that rare affection, nocturnal chorea, that is, chorea confined to sleeping or early waking hours, the same treatment is applicable. Full doses of arsenic should also be given.

NARCOLEPSY.

Recurrent attacks of irresistible sleep are not considered to constitute a disease *per se*, but to be always a symptom of some disease or abnormal condition. In the great majority of cases the attacks are due to either hysteria or epilepsy, but they may be caused by diabetes, chronic nephritis, disease of the heart, liver, or stomach, obesity, pregnancy, anæmia, or organic disease of the brain. Although the affection is but a symptom, it may be practically the only symptom of the causative disease and thus assume the appearance of an essential malady—as Gélineau and others have thought it to be. The frequency and duration of the sleeping-spells vary exceedingly. They

may occur at long intervals or many times in a day, and last from a few seconds to several hours. The intensity or profundity of the sleep is also variable. Some patients awaken, if disturbed, as from a natural sleep; others cannot be awakened at all.

Treatment is reasonably successful if directed to the cure of the disease that causes the narcolepsy. Symptomatic treatment, on the other hand, by the administration of caffeine, theine, or alcohol, and by forcing the patient into violent exercise at the onset, has always been most disappointing.

LOCOMOTOR ATAXIA, ACUTE INFANTILE SPINAL PARALYSIS, MYELITIS, AND AMYOTROPHIC LATERAL SCLEROSIS.

By M. ALLEN STARR, M. D., Ph. D.

LOCOMOTOR ATAXIA.

General Treatment.

There are two facts to be noticed before entering upon a consideration of the treatment of locomotor ataxia.

First: the disease from its very beginning depends upon certain changes in the sensory neurons and their axons in the spinal cord which are permanent in character, and hence complete recovery in any stage is impossible: all that therapeutic measures can hope to accomplish is to arrest the progress of the changes at the point reached, so that further symptoms may not develop; and this in the majority of cases is impossible with our present knowledge.

Secondly: the natural history of the disease is one of very slow progress, with periods of decided remission in some symptoms and of spontaneous disappearance of other symptoms, and also with long periods during which the patient remains in a stationary condition. Therapeutic measures may result in producing an arrest of the disease or in causing a remission of certain symptoms, yet the history of the use of numerous remedies, formerly employed but now discarded, should teach us that it is often a mistake to ascribe results which may be natural to means which have been employed. It is never to be forgotten that the desire for relief and the expectation that it is to follow the use of a remedy are potent factors in producing temporary results. When, therefore, remarkable results are claimed for any new remedy in the treatment of locomotor ataxia—as, for example, electrical applications, nerve-stretching, and suspension—the wise physician will show a becoming scepticism, even when making use of every means which may give the patient relief, and will wait for time to prove what is of actual service.

Climate.—Patients suffering from locomotor ataxia are usually very susceptible to changes in the barometer and in the humidity of the

atmosphere. They are more comfortable in a warm, dry climate, and any sudden change to cold or to wet weather produces an increase in their pain and inco-ordination. They also appear to suffer more in high altitudes. Therefore it is well for those who can afford it to seek to mitigate their sufferings by residing in the South during the winter and in the North during the summer. The climate of Southern California is perhaps the most equable during the winter months, and is certainly less cold and damp than that of Florida or of the Riviera, although these latter are preferable to a northern climate. The increased susceptibility to cold makes it necessary for the comfort of the patient to keep the temperature of his house during the winter at about 70° F., and to protect him from draughts. Yet it is rarely, if ever, advisable for him to abandon such an amount of out-of-door life as is most conducive to health and vigor.

Diet.—It cannot be claimed that any particular form of diet is advisable in this disease. It is not to be forgotten, however, that it is of great importance to keep the patient in a good general condition, and to increase, if possible, the nutrition of the body, thereby retarding the disintegration of nerve-elements. Any system of diet which, by excluding certain classes of foods, tends to derange the processes of digestion and nutrition should be avoided. I have seen patients much harmed by following rigid methods of diet, such as a strictly non-nitrogenous diet, or a diet of meat, bread, and hot water, or a vegetarian diet, and therefore I believe that a generous diet, including all forms of food, with a slight excess of fat in the form of cream or cod-liver oil, is to be recommended. A rather free supply of water is conducive to the elimination of waste products, and the use of coffee, tea, and beer or light wines in moderation need not be forbidden, though any indulgence in spirits is to be avoided. Tobacco may also be allowed.

Exercise.—From the earliest stage of the disease the patients complain that any effort, especially that of walking far or of standing for a long time, produces an unusual sense of fatigue. It seems reasonable therefore, to limit from the outset the amount of exercise taken, and, without confining the patient to the house or to his chair, it is well to caution him against any form of exertion which is sufficient to produce discomfort. Later in the course of the disease, when any movement is attended with difficulty, it may be necessary to urge upon the patient the dangers of taking to his couch or bed, and even in the stage of helplessness it is far better for him to sit up during the greater part of the day, as there is no question that the venous congestion of the spine produced by constant lying on the back is productive of an increase of pain in this disease.

Massage.—During the early stage and during the last stage massage may be of service. In the early stage deep massage to the mus-

cles of the back promotes the flow of venous blood through the spinal vessels and their anastomotic branches, and is the best means of relieving the congestion which is supposed to exist. Given at night, it often prevents the onset of paroxysms of pain and secures sleep, especially if the patient can be taught to lie on his belly and not on his back. In the last stage, when almost all voluntary motion is impossible, general massage, by promoting venous return, gives much comfort and aids nutrition. In the long-stationary stage of ataxia, when pains are not severe and when sufficient exercise can be taken for keeping up a fair circulation, massage is not needed. In some cases the tenderness of the skin prevents its use at all times.

Baths.—Almost every form of hydro-therapy has had its advocates, and it must be admitted that there is no method of treatment more serviceable in chronic spinal affections than the use of baths. To obtain the best results the patient must be sent to some mineral bath in the country where the combined influences of change of air, scene, surroundings, and diet, with the régime of a water-cure establishment properly conducted, can be secured. In the summer months a cool mountain-resort is to be selected. In the winter a southern mild climate is to be sought. It is much to be regretted that this country offers few such establishments as are to be found in France and Germany. It is possible, however, to find in many regions the proper facilities for bathing, and well-arranged establishments are rapidly multiplying as the need is felt. The mineral constituents of the water are of much less importance than the temperature of the bath, and when the latter is correctly regulated it makes little difference whether the spring furnishes sulphur or saline or iron water.

It appears to be quite generally admitted by those who have had experience with the use of baths in this disease that tepid and warm baths are preferable to all others. Hot baths—of a temperature exceeding 97° Fahr.—are considered injurious. They may relieve certain symptoms temporarily—in fact, no means will act more quickly than a hot bath for the relief of pain—but the ultimate effect of a succession of hot baths is to increase the rapidity of progress of the disease and to intensify the symptoms. Cold baths—of a temperature below 65° Fahr.—are also injurious. It seems probable that damp cold air or exposure to wet and cold are factors in the production of locomotor ataxia, and the discomfort resulting from a cold bath is very great to the majority of patients. When baths are used it is better to have the temperature of the water vary between 70° and 90°, as within these limits a sufficient alternation of heat and cold can be secured.

There are many methods of using water in baths. Spinal douches may be given by directing a stream of water of some force from a spout against the entire length of the spine, the temperature of the

water being varied during the douche from 90° down to 70°, or else being kept constantly at 85°. This may be used for ten seconds daily. Or the patient may have the spine sponged with water while he sits on the edge of a tub or in a sitz-bath. The sudden alternation from heat to cold, 90° to 70°, in such sponging may be employed at the end of the bath. Both these methods are to be followed by brisk rubbing with warm towels. A full bath at 90° for twenty minutes is a method frequently employed, and when a course of iodide of potassium is being pursued this is to be used daily. The "salt rubs" and "alcohol baths" of various establishments are not objectionable, provided the temperature of the water be within the limits prescribed.

It is evident that all these procedures act upon the spinal circulation, either by affecting the calibre of the vascular system in general or by producing such peripheral irritation of the skin as to cause reflex vasomotor effects. In either case the circulation in the cord is stimulated, congestion whether arterial or venous is relieved, and waste products removed, with the result of increasing the nutrition. Such measures may be carried on at home, provided the patient's means do not admit of the expense of a residence in an establishment.

Baths are not to be continued for very long periods consecutively. It is better for this method of treatment to be used thoroughly twice or three times a year for a period of two or three months, and then stopped.

The use of tepid packs to the extremities or to the abdomen for an hour or more for the relief of pain is highly recommended. The extremity is enveloped in flannel wrung out in warm water and covered with oiled silk. The damp heat often relieves the lancinating pains promptly.

Counter-irritation.—Counter-irritation to the spine, whether by blisters, cautery, setons, ice-bags, poultices, or cups, has been generally abandoned as a means of cure. In some cases pain, if severe, may be relieved by the application of an ice-bag to the spine for a short time or by the use of dry cupping. These, however, are of but temporary service, and are probably not without a harmful influence upon the progress of the lesion.

A mild form of counter-irritation to painful parts is sometimes of service in relieving the severe pain. The part may be stroked with a faradic brush, may be heated by a mustard poultice, blistering being avoided, or may be stimulated by liniment, the surface irritation appearing to counteract the pain of central origin. In all local applications in locomotor ataxia it should be remembered that great care is to be observed, for the senses of pain and temperature are often impaired, so that the patient is unable to perceive degrees of heat or pain which are harmful. If hot foot-baths are used, the feet should not be blis-

tered unwittingly, and if hot bags or poultices are applied, they must be watched, as no reliance can be placed on the patient's sensations.

Electricity.—Electricity is an agent which has for the past fifteen years been used quite generally in the treatment of chronic spinal diseases, including locomotor ataxia. A galvanic current has been recommended by Erb and others as the only form of electricity which influences the progress of the disease. It is applied to the back, one pole being placed upon the neck or between the shoulders, the other low down upon the lumbar region. The upper pole is sometimes placed over the sympathetic ganglia in the side of the neck, though no evidence has ever been furnished of any direct action upon the sympathetic nerves, and if this method is used it is wholly empirical. A current of medium intensity is usually preferred; that is, a current not greater than 20 milliampères in strength, the electrodes employed having an area of about 100 square centimetres (3 by 5 inches). The direction of the current, whether ascending or descending, appears to be a matter of indifference. The duration of the application may be from three to ten minutes daily or every other day.

Those who were at first enthusiastic regarding the effects of electricity in locomotor ataxia appear to be gradually modifying their opinions, and, although this method of treatment is still pursued by some specialists, it is now discarded by many others. It is a matter of much doubt whether a current as weak as that mentioned affects the spinal cord at all. It certainly fails to produce any subjective peripheral sensations, which is the test of its reaching and affecting a peripheral nerve, such as the sciatic. On the other hand, when much stronger currents are used there seems to be some danger of unpleasant results, such as vertigo and a sudden increase of the symptoms of the disease. So little is still known of the exact effect of galvanism on the spine, and the knowledge of its action elsewhere leads so directly to the conclusion that it cannot have any effect upon the progress of a sclerosis, that it seems incumbent upon those who persist in this treatment either to bring forward some positive results or to clear themselves in some other manner of a suspicion of great credulity. For my own part, I agree with Gowers and Möbius that as a therapeutic agent in locomotor ataxia it is useless, either as a direct agent affecting the progress of the disease or as a means of treating individual symptoms.

Suspension.—A recent method of treatment proposed is that of suspending the patient by his head and arms for half a minute or longer daily. This is done by means of an apparatus used by orthopædic surgeons for suspending a person during the application of a plaster jacket. The only care necessary is so to adjust the supports as to make less traction by the head than by the arms, and to pad the support under the arms, so that serious compression of the nerves

and veins of the axilla shall be avoided. The patient is pulled up slowly until the feet are clear of the floor. On any expression of discomfort or any appearance of syncope the process is to be stopped at once. It is thought best to begin by a short séance—one half minute—and gradually increase the duration to three, or even four, minutes daily or twice daily.

This method is not considered curative, but has been said to cause relief of many symptoms, cases being recorded in which pain diminished, bladder and rectal control was re-established, sexual power was restored, and the ataxia so much relieved that walking was made more easy. It has been said that a return of the knee-jerk occurred during the treatment.

During the first year in which the method was employed reports of great improvement in many cases were published. Russell and Taylor[1] collected 255 cases recorded by Continental observers, in 67 per cent. of which a distinct improvement was noted; in 30 per cent. no improvement occurred; and in 3 per cent. the patients became worse. They could not confirm these results, however, by their own experience, for out of 32 cases only 6 improved, 23 did not improve, and 3 became worse. The experience of Erb, Bernhardt, and Dujardin-Beaumetz seems to agree with that of Russell and Taylor. My own experience in about 20 cases is even less favorable, there being but 1 patient out of the 20 who now, at the end of two years, considers it worth while to keep this treatment up. There is certainly no objection, however, to its employment. The apparatus is not expensive, it can be put up in any house, and a patient can soon learn its details sufficiently to have it carried on at home by a servant or member of his family. But the more recent reports on all sides confirm the suspicion that suspension, like nerve-stretching and the actual cautery, is not destined to become a permanent method of treatment in locomotor ataxia.

Fränkel Movements.—Fränkel, of Berlin, has found great improvement in coördination to follow the systematic practice of certain motions. The patient is made to stand with the aid of some support and to trace with each foot in turn some line on the floor—straight line or triangle or semicircle. He practises such carefully directed motions for ten minues three or four times daily, and by the end of a month is able to walk much more steadily—his coördination being educated. Motions of the hands of a similar kind may also be practised.

Medicinal Treatment.

In the majority of cases of locomotor ataxia syphilis has been the probable cause. It is not supposed that the disease is an actual manifestation of syphilis, but that it is a sequel of it. Whenever a history

[1] *Brain*, 1890, vol. xiii. p. 217.

of previous infection is obtained or whenever its existence is strongly suspected, it is justifiable to make a trial of specific treatment, for experience has proved that in a considerable percentage of cases this has been of benefit. Mercury is to be used by inunction, ½ drachm of the ointment being rubbed into the skin daily until a slight physiological effect is produced. It is well to mix the officinal blue ointment with an equal part of lard or simple cerate, as absorption is then more complete. The inunction may be made upon the back or upon various parts of the body and extremities, a new part being chosen daily. It is better absorbed if the part selected be thoroughly washed with warm water and soap, and then with alcohol or ether, before the application; and after the application—which should be thorough, and therefore should take half an hour—a tight flannel bandage should be applied over the part rubbed; thus what is left on the surface is gradually absorbed. It aids materially in the effect if the patient takes a warm bath (99° F.) daily for twenty minutes. The production of salivation is to be avoided. If inunctions cannot be employed, the mercury may be given by the stomach, the protiodide, in dose of from $\frac{1}{6}$ to $\frac{1}{3}$ grain three times daily, being the best preparation. The amount may be increased gradually until a slight diarrhœa is produced, and then a dose a little less than that which caused the diarrhœa may be kept up for some time. Corrosive sublimate may be employed—from $\frac{1}{40}$ to $\frac{1}{30}$ grain three times daily—in the same manner. The advantage of the method by inunction is that it does not affect the digestion unfavorably. Iodide of potassium is to be given in connection with the mercury in gradually increasing doses, from 15 to 100 grains three times daily. It should be administered, very largely diluted, in an alkaline water after meals or else in a bitter tincture before meals. It is well to reduce the large dose of the iodide after a month, and then to continue it in 25-grain doses three times daily for two or three months longer. If free elimination of the iodide is secured by the use of laxatives, of diuretics (of which water is the best), and of warm baths daily, it can be taken for a long period.

It is well to make a thorough trial of this treatment in cases of locomotor ataxia, and if a decided improvement takes place it is well to continue the iodide and to repeat the course of mercurial inunctions at intervals of four months, each mercurial course lasting from two to four weeks, according to the toleration shown by the patient. In cases in which there is a subacute spinal meningitis with the sclerosis this treatment gives the best results. It is to be remembered that the use of mercury hastens the process of optic-nerve atrophy, and therefore in the class of cases of locomotor ataxia in which optic-nerve

atrophy is the initial symptom—a class quite easily separated from the ordinary type—this line of treatment is not to be employed.

In cases which are not syphilitic in origin or in which specific treatment has failed one may use other drugs. The best line of treatment, in my opinion, is the use of arsenic in small doses (arsenious acid, $\frac{1}{40}$ grain three times daily) or the continued use of corrosive sublimate, $\frac{1}{50}$ grain three times daily, or both used alternately. Arsenic is one of the best nerve-tonics, and may possibly retard the disintegration of nerve-fibres in the sclerotic areas of the cord. Corrosive sublimate is believed by many to retard the production of connective-tissue inflammations.

I have had good results from the long-continued use of glycerophosphate of soda, 15 grains three times a day.

Ergot, which was formerly extensively employed, either in the form of fluid extract $\frac{1}{2}$ drachm, or of ergotin, $\frac{1}{3}$ to 1 grain three times daily, is not, in my experience, of any permanent benefit. If it is used, it should not be given continuously, but only four days in every week (Charcot).

Nitrate of silver has also been used for many years, and still has some reputation. It is to be noted that this drug has usually been given in pill made up with a vegetable extract. As a matter of fact, when thus prepared it turns into an oxide of silver within a day or two; hence it is quite likely that patients have not had the benefit of the drug. It should be administered with kaolin in a capsule. When so given it is very liable to disturb the stomach, and if kept up for any length of time discolors the gums, mucous membranes, and skin a dark blue. On the first sign of such an effect it should be stopped. Recently the use of this drug hypodermically has been urged, but it is too soon to report success.

Strychnine is universally discarded in the treatment of ataxia, excepting as a temporary remedy for the relief of incontinence of urine, in which it occasionally succeeds.

Belladonna has also been tried, but seems to have little claim to usefulness.

There has not as yet been found any drug which can be said to be curative in the disease.

There are certain symptoms of locomotor ataxia which require treatment. Pain is the chief one, and for this the most valuable remedies have been discovered recently in antipyrine, acetanilide, and phenacetin. Given preferably in a triturated powder in their ordinary dose and repeated two or three times a day, they succeed in quieting pain very well. I prefer to prescribe each remedy separately, using each for one week at a time and changing about, so that the dose need not be constantly increased. Salicylate of sodium, in 10- to 20-grain doses, some-

times acts when the drugs just mentioned fail. In many cases, however, recourse must be had to opium, codeine, or morphine. It is often possible to combine these drugs with others which neutralize their disagreeable effects, as in Brown-Séquard's neuralgic pill. Eventually, the hypodermic use of morphine may be resorted to, and seems to be wholly justifiable in a disease which is very painful and chronic.

The treatment of painful areas by the faradic brush, by cold or hot applications, or by cupping the spine has already been alluded to.

Against the crises of locomotor ataxia we have but one sure remedy—viz. morphine hypodermically—and this should be used freely to relieve these distressing symptoms. Antipyrine and phenacetin have been recently recommended in the treatment of gastric crises.

The sense of stiffness which attends this stage of ataxia is frequently relieved by the use of warm baths, as already described.

The jumping of the limbs which often annoys the patient toward evening is best controlled by bromide of sodium, given with Hoffman's anodyne.

The chronic constipation usually requires the habitual use of some laxative, especially if opium is being employed for the relief of pain.

Chronic cystitis, bed-sores, or ulcers of the foot must be treated according to the usual methods described in surgical textbooks.

For the optic-nerve atrophy no treatment seems to be of avail, although hypodermic injections of strychnine and the use of iodide of potassium have their adherents.

ACUTE INFANTILE SPINAL PARALYSIS.

At the onset of this disease, when the fever is high and when an acute congestion of the spinal cord is present, it is important to use antipyretic measures and also local counter-irritation to the spine over the site of the lesion. The best antipyretics in children's cases are cool baths, sponging with alcohol, and the internal administration of antipyrine or phenacetin. A spinal ice-bag may be applied for an hour at a time. The counter-irritation may be excited either by dry cups, repeated every three hours for two days, or by a blister. At this period it is important to prevent the child from making any voluntary movements, and to keep it in a prone position or on its side, rather than on its back in bed. A brisk purgative is to be given at the beginning of treatment, and nourishment is not to be neglected. Children are so restless when ill that it may be necessary to give a

sedative in the form of bromide of potassium, and this may be combined with fluid extract of ergot, which all authorities agree should be given in the early stage in full doses—*i. e.* 10 drops every four hours for a child of one year, 15 drops for a child of two years, 20 drops for a child of three, and 25 drops for a child of five. The hypodermic injection of ergotin, $\frac{1}{6}$ to $\frac{1}{3}$ grain, is objectionable, as the local irritation is extremely painful. It is questionable whether the large doses of iodide of potassium recommended by Ross, in conjunction with inunctions of mercury to the spine, can be of service in such an acute disease.

The ordinary measures used in acute febrile diseases for the relief of gastro-intestinal symptoms may be employed if necessary. In the cases which begin with convulsions bromide of potassium or chloral by the rectum may be used.

After the acute stage of onset is over the patient is found to be paralyzed in one or more limbs, and this paralysis requires persistent and careful treatment, both for the purpose of restoring power and in order to prevent deformities.

It is to be remembered that each muscle is controlled by a group of cells in the spinal cord, and just in proportion to the extent of disease in the group will be the paralysis of the muscle. If all the cells in the group are destroyed, the muscle will be totally paralyzed. If some or many of the cells remain intact, the muscle may regain some or all of its power. It appears that half a group may by stimulation and training be made to do the work of an entire group, and hence treatment properly directed is of service. The name "regressive paralysis" once given to this disease indicates that some return of power is the rule.

A direct stimulus to activity in the motor cells may be given by means of strychnine. It is to be recollected that this produces hyperæmia of the cord, and therefore should never be given until the acute onset is over: a good rule is not to give it within a month of the onset. After that time it is to be pushed until slight twitching of the normal muscles, or at least decided increase of the spinal reflexes, is produced. It is probably better to employ strychnine for some months in the dose found to produce such symptoms, but to give it only four days in each week, as the intermittent use seems to stimulate the cord more than continuous use. I am accustomed to use arsenious acid, $\frac{1}{40}$ grain three times daily, in connection with the strychnine, as a nerve-tonic. The two may be administered together in a tablet, which is easily given to a child, or may be dissolved if the child cannot swallow it.

Much more important, however, than internal medication is the direct stimulation of the muscles. Voluntary exercise is the best

method of such stimulus, and when any movement can be produced voluntarily it should be encouraged and persisted in for years. It is an easy matter for any one to invent an apparatus for the exercise of muscles, and any carpenter can construct it. Weights hung upon pulleys, or boards balanced on a fulcrum and weighted or under pressure of springs, will afford the necessary resistance, and as the muscle grows stronger the resistance may be increased. The child must be made to perform these requisite exercises two or three times a day, and, as they can be made a part of its play by an ingenious mother, they need never be neglected. Just as a normal biceps may be developed in a gymnasium to twice its original diameter, so by exercise a half-paralyzed muscle may be brought up to a point at which it will do an amount of work nearly equal to the normal. There are few cases in which voluntary power is entirely gone, and therefore such exercises are possible for the majority of children who suffer from the disease.

Next to voluntary exercise, every possible means is to be employed to increase the nutrition of the paralyzed limb. Massage, thorough, systematic, and skilful, should be used twice daily. Frictions with hot and cold water, or with salt followed by hot douching, or with alcohol, are of undoubted use, and the limb should be well protected from cold by extra clothing, since its circulation is always imperfect.

Electricity applied to the muscles will secure their contraction, and hence will exercise them when voluntary exercise is impossible. At the same time, applied in the form of galvanism, it promotes all those chemical changes in the parts near the poles which are essential to growth. To the muscles which respond to faradism a faradic current should be applied for ten minutes daily. Such response may be obtained in muscles which are only slightly paralyzed, and these will recover spontaneously in time, but will regain their power more rapidly under faradic treatment. The muscles which are seriously affected do not, however, respond to faradism, and to these it is necessary to apply an interrupted galvanic current, faradic applications being useless. These muscles respond more vigorously when the positive pole is placed on the muscle; hence that is the pole to be used, the negative being placed on the back. The interruptions should be made by an electrode held in the hand and provided with a finger-key, and each muscle should be treated for about three minutes daily: about 100 interruptions can be made to the minute by the finger. The strength used should be the least which will secure a contraction in the muscle. When interruptions of the current do not produce a prompt response, alternations of the current may be employed by placing either pole on the muscle, and the other on the same limb about a foot away, and reversing the current by means of the pole-changer on the battery.

The reversals can be made by the hand at the rate of 60 a minute, or by some little mechanism at a more rapid rate.[1]

It is to be remembered that in this disease the application of electricity is much more painful than in health. It is also to be remembered in applying electricity to children that their confidence must be gained and the fright produced by the sight of the apparatus allowed for. It is my habit to begin a course of electrical treatment in a child by several applications of the sponges and electrodes while no current is passing, thus accustoming the child to the apparatus, then to apply an exceedingly weak current, and gradually increase its strength day by day until, at the end of ten days or more, I am using the desired strength. In this way a daily struggle, with the result of an unsatisfactory and probably useless application, is avoided, and the parents' consent obtained to a course of treatment which they would eventually object to if every application resulted in a tearful scene.

Any intelligent mother or nurse can be taught to give galvanism to a child in this manner, and it should be made a matter of interest to her from the start, so that she will observe what is being done, and thus gradually come to understand each proceeding. I find it better with many mothers and nurses to ask their aid, and direct them what to do, until I see that they have become used to the process, before suggesting that they can do it themselves, as thus they acquire the routine better than when attempting to learn it by direct instruction.

Such an application may be made daily for two or three years. If the muscle grows under this treatment, it should be kept up longer. But if exercise, massage, frictions, and electricity have had no apparent effect at the end of two years, there is no use in any further local treatment of this kind. I do not apply the electrical current to the spinal cord in these cases, as I believe that it has no effect whatever upon the pathological process which is present.

The use of apparatus plays a great part in the treatment of infantile paralysis. The importance of voluntary exercise has already been enforced. It is to be remembered that many weak muscles can do their work only when the limb is placed in an advantageous position. Hence an apparatus may enable the child to exercise a muscle by voluntary effort when unsupported this would be impossible. Again, many muscles give support to joints as part of their function, and if this support is removed it may be supplied by a brace. Lastly, the result of paralysis in one group of muscles is to allow the joint to be bent by its opponents or to yield to the influence of gravitation, and hence the paralysis is often followed by deformity which a brace may correct. Every one knows that a brace properly applied may enable a helpless cripple to walk; and it must be admitted that there is no

[1] See *Amer. Jour. Med. Sci.*, Oct., 1891, p. 364.

disease in which orthopædic apparatus gives more marked benefit than in infantile paralysis. It cannot be applied too early, as it may then prevent the development of contractures and deformity. There is no stage in which it is too late to fit a brace, even though tenotomy be needed in addition and as a preceding necessity. Each case has to be inspected and studied carefully, and a particular apparatus fitted properly to it, the ready-made braces of the shops being usually worse than useless.

Many a child has been saved a bad club-foot by the early application and constant use of a proper brace to the leg, the other means of treatment already mentioned being employed as well. Many a child with a bad club-foot can be made to walk quite naturally by tenotomy, plaster splints, and then a proper brace. And when the importance to recovery of voluntary exercise is considered, it becomes evident that anything which puts the child on its feet is to be employed early. For the arm, various contrivances, such as rubber bands running in bracelets as a substitute for muscles, are to be invented. In the rare cases in which the spinal muscles are involved an apparatus to rectify the curvature must not be neglected. Reference must be made to the works upon orthopædic surgery for details regarding such apparatus; and it is my experience that more satisfactory results are obtained by having the apparatus constructed under the direction of an orthopædic surgeon than by a mere medical-instrument-maker instructed by a well-meaning but ignorant physician.

MYELITIS.

Acute myelitis, whether general or transverse, traumatic, hæmorrhagic, or of unknown origin, requires active treatment in order to arrest the destructive process which advances rapidly in the spinal cord. If there is a fracture or dislocation of the vertebræ, with pressure on the cord, prompt surgical interference by operation should be resorted to, that the effects of pressure upon the cord may if possible be removed. Since continued pressure is sure to lead to myelitis and degeneration in the cord, with a resulting permanent paralysis, it is best to remove it immediately, even at some risk, and even though it seems probable that the cord has been lacerated as well as compressed at the time of the injury.

If this is impossible, the case is to be treated as if of non-traumatic origin. When the disease is not of traumatic origin the patient is to be kept at perfect rest in a prone position, and counter-irritation by

wet cupping is to be used along the spine or over the particular level affected, if this can be localized, and an ice-bag is to be applied to the spine for some hours at a time, and renewed at intervals, freezing being avoided. If the patient is weak, dry cups may be used instead of wet ones, or an actual cautery may be applied lightly so as not to cause a blister. Blisters are to be avoided, as they may result in bed-sores. While this external treatment is being used the patient should be purged once by jalap or calomel, and subsequently by saline laxatives, and be given diuretics freely. His diet should be simple, and during the first week rather scanty, unless he is decidedly feeble in health. Cleanliness of the skin and genitals is to be secured, especially when the sphincters are relaxed, by very frequent changes of position, by washing, by rubbing with alcohol and alum-water, or by oiling the surface with vaseline. Numerous small pillows should be used about the body, and so disposed that its weight should be evenly distributed, instead of being borne by the bony prominences, or else a water-bed should be provided. A bag of oiled silk filled with absorbent cotton should be placed upon the genitals to catch the urine, and changed very often, and the genitals should be frequently cleansed with warm water and then oiled. In this way it is possible to avoid bed-sores and ulcerations of the skin in some cases. Very careful observation of all these details in the beginning may save much trouble in the care of bed-sores later on. A patient should never lie continuously in one position more than an hour, and when the beginning redness of the skin indicates that pressure has been made upon it, pads and pillows and rings of wadding or of oakum should be applied immediately to take off such pressure. It is to be recollected that very frequent changes of position, even in sleep, are normal, and take place without notice, being automatic. But in myelitis the reflex and automatic acts are impossible, and must be performed for the patient by his attendant.

If the bladder and rectum cannot be controlled, it is necessary to draw the urine regularly every four hours, and to wash out the bladder with a warm solution of borax (1 drachm to the pint) twice a day, to prevent the occurrence of cystitis. The rectum should be emptied by a full enema of soap and water daily. The fact that death in this disease is usually due to cystitis or to bed-sores should enforce the absolute necessity of the greatest care in their prevention and treatment. If cystitis has developed, it is to be treated in the customary manner. If bed-sores have occurred, they are to be dressed daily with carbolized vaseline, balsam of Peru, or oxide-of-zinc ointment, after thorough cleansing with a solution of corrosive sublimate. The fact that such sores heal very slowly, even under the most favorable conditions, is proof that the lesion in the cord has cut off certain trophic influences from the parts.

The only medicinal treatment of myelitis during the acute stage is the giving of ergot in drachm doses and iodide of potassium in 10-grain doses three times daily. Belladonna is no longer employed.

Chronic myelitis is usually the result of an acute attack, but may develop without an acute onset. In either case the treatment will be the same. If the patient is confined to bed, he should be made to change his position frequently, and the same precautions against bed-sores and cystitis are to be employed as in the acute disease. If possible, he should be made to sit up and be taken out in a wheeled chair. If he is able to be up and about, all unnecessary exertion, especially walking, and all sexual excitement, are to be avoided, and exposure to cold or dampness is to be guarded against. Tonics are to be used freely, iron, quinine, arsenic, and strychnine being employed in succession or in combination. The question of the use of strychnine is a disputed one. In chronic diffuse myelitis, where reflex excitability is not great, it may be employed, given in doses of $\frac{1}{40}$ grain three or four times a day for two weeks. If, however, there is much irritation of the limbs, as in transverse myelitis, it is to be avoided. In the chronic stage counter-irritation of the spine appears to give some relief at times, and the actual cautery may be used lightly. The tone of the muscles is to be kept up by the use of massage, salt rubbing, and electricity, as in cases of acute infantile palsy in the chronic stage. In mild chronic cases of slow progress the rules given regarding the use of baths in locomotor ataxia apply. Douches to the spine of hot water or of hot followed by cold water are of service in this class of cases. In the more severe cases baths are not easily employed. The rigidity of the limbs with contracture, which develops in many severe old cases, is best combated by the use of long-continued warm baths, 90° F., for half an hour daily or twice a day.

Chronic myelitis is rarely the result of syphilis, and even when it is a course of specific treatment is not generally of much use. Whether iodide of potassium, which is usually administered for a long time in chronic myelitis, does any good is a question which cannot be decided. It may be tried in the absence of more efficient remedies. Galvanism applied to the spine in the same manner as in locomotor ataxia has been thought to be of service, and may be employed. I have never seen any positive result from its use, and it is never to be employed in the acute stage of myelitis. The same symptomatic remedies which are discussed in the section on Locomotor Ataxia are to be employed in chronic myelitis.

AMYOTROPHIC LATERAL SCLEROSIS.

The treatment of amyotrophic lateral sclerosis and of its allied affection, bulbar paralysis, like that of progressive muscular atrophy and of primary or secondary lateral sclerosis, requires but a few words. In these diseases there is a tendency of the lesion to progress slowly but steadily in spite of every form of treatment which has been adopted, and no means has as yet been found to arrest the course of these diseases. The care of the patient, rather than his cure, is therefore the work of the physician. The remarks regarding diet, exercise, climate, and baths in the section on Locomotor Ataxia apply to these diseases, and need not be repeated. In amyotrophic lateral sclerosis rest is very important, and seems to retard the progress of the case. Strong tonic treatment is indicated, but strychnine is to be used with great caution, and suspended if reflex excitability becomes marked. The exercise of the paretic muscles by electricity is merely a palliative measure, for even if the muscles grow in size by exercise, the cells which control them are degenerating and a progressive atrophy will not be prevented. And in these diseases the most enthusiastic advocates of galvanism to the spine have admitted the uselessness of treatment. It should therefore be the object of the physician to keep the patient's health in good order and to use symptomatic remedies as they may be needed.

APOPLEXY, BRAIN TUMOR, SPINAL TUMOR, MENINGITIS, CEREBRITIS, AND NEURITIS.

By CHARLES K. MILLS, M. D.

APOPLEXY.

The term *apoplexy* has been and is still used in several ways, but most correctly in describing an attack of sudden insensibility, the word "stroke" having popularly the same meaning. This insensibility may come on in various ways, and it will present features which will differ according to the severity, character, and site of the lesion to which it is due. In a common type of cerebral apoplexy the attack is preceded by such symptoms as dizziness, tinnitus, headache, changes of color in the face, and nausea or vomiting, although any one, several, or even all of these prodromes may be absent or others may take their place in a particular case. After, or without, such preliminary symptoms the patient loses consciousness, as a rule suddenly; his breathing becomes stertorous or Cheyne-Stokes in character; and examination shows paralysis of one side of the body, sometimes of motion only, and sometimes both of motion and sensation; while other phenomena often present are conjugate deviation of the eyes and head, fixed and it may be irregular pupils, absence of or marked changes in the reflexes, and involuntary evacuations of urine and fæces.

This will answer for a brief general description of the most usual, or at least the best-known, form of apopletic seizure, but variations even in what might be designated the standard form of attack occur. The most marked differences in the state or degree of impairment of consciousness may be present: sometimes the loss is profound and complete, and may last for hours and even days; sometimes while deep it is short, even momentary or lasting for a few minutes only; sometimes it improves and deepens again.

The motor paralysis and loss of sensation may vary considerably. In a short time the attack may change its character for better or worse. When the patient does not succumb immediately or soon, in typical cases the symptoms assume more or less regular features as to temperature, respiration, pulse, and even paralytic phenomena at certain stages of the progress. My object, however, is first to

make clear the peculiarities and nature of the initial stroke and their meaning, in order that the method of dealing with them may be better understood. Later I will consider the occurrences of the periods following the acute attack.

The symptom-picture often designated apoplexy may be caused by a variety of pathological conditions, as, for example, by hæmorrhage into the brain or its membranes, by congestion of the brain, cerebral embolism, or thrombosis, by uræmia, sunstroke, or the ingestion of a violent poison. The most common types of apoplexy are due to cerebral hæmorrhage, embolism, or thrombosis, and frequently the word is used by physicians as synonymous with hæmorrhage into the brain. My chief concern will be with this form of apoplexy, although some attention will necessarily be given to the occurrence of seizures from embolism or thrombosis of intracranial vessels, as well as to the other affections which simulate cerebral hæmorrhage.

It would be best to abolish the use of the word "apoplexy" as a name for a disease, and discuss treatment, pathology, symptomatology, or anything else from the standpoint of lesions the nature and location of which are known, as intracerebral hæmorrhage, embolism, or thrombosis; but one practical reason for the retention of the term as a heading for articles is that the mass of practitioners are in the habit of considering their cases with reference to the stroke or seizure, and also of searching for information from the same point of view. Properly speaking, the term is one descriptive of a symptom or group of symptoms, but the same is true of many other terms used in medicine; for example, headache and diabetes. Hæmorrhage into the lungs or other organs is now often described as an apoplexy; nevertheless, with the profession at large, apoplexy retains its old significance, that of a stroke of insensibility caused by a hæmorrhage somewhere within the skull.

Several forms of brain attack which are spoken of as apoplexies are sometimes confounded with cerebral hæmorrhage, as the so-called nervous apoplexy, serous apoplexy, and congestive apoplexy, or acute hyperæmia of the brain and its membranes. Nervous apoplexy had better be dismissed entirely, as the use of the expression is probably simply an evidence of insufficient knowledge. It has been employed to describe cases presenting sudden abolition of consciousness and motion, with disturbed respiration and circulation, and ending fatally, in which no lesion has been found on careful examination after death. Some of these cases are due to uræmia or other forms of cerebral toxæmia, and evidence has accumulated to show that apoplectic seizures associated with or followed by such unilateral symptoms as hemichorea, hemispasm or monospasm, hemiplegia or monoplegia, sometimes occur in the course of Bright's disease, autopsies revealing no trace of a focal

lesion small or great. Several French observers and Dercum[1] of Philadelphia have reported such cases. This is of course important to bear in mind for therapeutic reasons, as treatment directed to the relief of the kidneys and the general toxæmia is indicated rather than that for cerebral hæmorrhage or other isolated lesion of the brain.

Lidell[2] is inclined to attribute the nervous apoplexies to irritation reflected to the brain from distant parts, but a more probable explanation of such cases is on the nephritis hypothesis given above, or on the view that the cases are due to hysteria, to syphilis, or perhaps even to gout or rheumatism. The rare attacks of so-called cerebral gout and cerebral rheumatism sometimes give apoplectiform phenomena which closely resemble those which are produced by cerebral hæmorrhage, embolism, or thrombosis, but usually in such cases a gouty or rheumatic history, or symptoms of these affections in other parts of the body, are present.

Serous apoplexy has more importance and cannot be so lightly dismissed. Every one who has made many autopsies knows that one of the commonest conditions found in patients who have died from brain disease or at least with brain symptoms is an excess of serum or of cerebro-spinal fluid, either in the ventricles or beneath the pia-arachnoid membrane; but such effusions are rarely of abrupt origin. They are found in such well-known congenital and degenerative diseases as porencephalus, in which brain-substance has so disappeared as to leave a hole, which fills with fluid. In the aged, and sometimes in others suffering from forms of arrest of development, considerable shrinkage of the brain often occurs, and serum takes the place of the atrophied and flattened convolutions, so that the brain is found œdematous and wet. Such effusions are simply compensatory, and are never of sudden origin; but a patient dying acutely from some other cause and effusion being found, the conclusion is reached that the death is due to serous apoplexy. In nephritis a sudden form of uræmic coma or apoplexy does certainly occur, and œdema of the brain may be present in such a case, just as we may have œdema of the lungs or of other organs, although the cerebral symptoms may in reality be more dependent on changes in the composition of the blood than on the œdema. Such an attack is perhaps the nearest approach to a general serous apoplexy. The treatment for such cases should be with the view of relieving the kidneys and blood, and not that for true apoplexy from either the breaking or the occlusion of vessels: remedies which would be contraindicated in a genuine apoplexy might be called for, as, for example, active cathartics, diaphoretics, bloodletting, digitalis, caffeine, etc.

[1] *Journ. Nerv. and Ment. Dis.*, Aug., 1887.

[2] *A Treatise on Apoplexy, etc.*, New York, 1873.

The occurrence of congestive apoplexy has been both affirmed and denied; by some entire chapters are devoted to its consideration, while by others it is regarded as only a part of other diseases, or as rare. Autopsies are unreliable, owing to the changes which take place with death. The clinical and pathological evidences, however, are in favor of the occurrence of what may be termed active and passive congestion of the brain: in the former too much blood is pumped too rapidly into the arteries; in the latter too little blood leaves the veins, and leaves too slowly, the result in either case being widespread capillary engorgement. I need not here consider the etiology of these forms of congestion. Diseases of the heart and of the vessels are among the most common causes. When extreme congestion is rapidly induced sudden or at least speedy abolition of consciousness —that is, congestive apoplexy—may ensue. Usually this term, "congestive apoplexy," is applied to the affection of active type occurring in the plethoric. Occasionally convulsions accompany congestive apoplexies, and frequently, if they do not terminate fatally, delirium and fever are present for a time. The sudden loss of consciousness usually follows more or less serious symptoms of cardiac, vascular, and brain disturbance, such as rapid action of the heart, throbbing vessels, headache, fulness and heat in the head. Some of the patients who recover from the seizure are left for a time with more or less marked loss of power on one side of the body—a temporary monoplegia or hemiplegia —which has led to scepticism as to the cases being simply congestive, it being held rather that small extravasations may have occurred.

Congestive apoplexy may be, and probably usually is, accompanied by minute hæmorrhages or diapedesis of the red blood-corpuscles. The treatment of congestive apoplexy is the same as that of some, but not of all, cases of the true hæmorrhagic attacks. As the symptoms are commonly active in type, the remedial measures should in like manner be active: bleeding local or general, cathartics, bromides, and ergot should be unhesitatingly employed, whereas, as will be seen, the use of such remedies in massive hæmorrhages is sometimes not only uncalled for, but may be absolutely contraindicated. It is not, however, within my province in the present article to go into a full discussion of hyperæmia of the brain, but it is necessary to be borne in mind for the differential purposes both of diagnosis and treatment.

Congestion of the brain of the passive or venous variety must not be confounded with either congestive apoplexy of the active type or with intracerebral hæmorrhage, or treatment will go astray with resulting injury to the patient. Such venous hyperæmia is usually due to diseases of the heart or lungs, to thrombosis of the sinuses, or to mechanical interferences with the circulation, and the treatment insti-

tuted must be based upon a consideration of the pathology of the disorder. In such cases Niemeyer recommends venesection or leeching if the obstruction cannot be removed, but first attention must be paid to the removal of the cause.

Lidell considers congestive and serous apoplexies as belonging to the same class, and gives a number of cases with autopsies in which both congestion and œdema were present, and others in which either hyperæmia alone or œdema alone was found. Many of these cases were in chronic alcoholics, in whom not only disease of the kidneys was present, but the brain and its membranes were in a chronic state of deterioration. Such cases correspond closely to those to which I have already alluded as having either compensatory effusions or nephritic œdemas, or perhaps a combination of both. Besides nervous, serous, and congestive apoplexies, and the sudden attacks occurring in rheumatism and gout, other states of insensibility, which may more or less closely simulate the apoplexy which chiefly concerns us at present, result from such affections or conditions as sunstroke, drunkenness, epilepsy, opium, other narcotic poisons, syncope or fainting, trance, catalepsy, coma due to ventricular effusion, to fractures, or to brain-poisoning by gases or anæsthetics. Of course in a therapeutical article it will not be possible to go into a discussion of these varieties of insensibility and their diagnoses. The symptomatology of most of them has been considered under their own appropriate heads, but they are referred to for the reason that prompt and correct diagnosis is at no time of more importance for judicious treatment than when the physician is confronted by an insensible patient. He must decide not only what he has before him, but do so quickly if his services are to be of any value, and in order that he may come to speedy decision correctly the numerous affections which simulate and counterfeit each other must be before his mind.

Dismissing further consideration of these numerous forms of insensibility, I will now treat of apoplexy due to hæmorrhage into the brain, and also of those forms of apoplectic seizure which are the result of embolism or thrombosis. Much that can be said of the treatment of hæmorrhagic cerebral apoplexy is equally applicable to embolism and thrombosis. All that is said in the main body of this article should be regarded as distinctly relating to the hæmorrhagic variety of apoplexy: in its concluding portion the differences in treatment necessary to be made when the probabilities are in favor of embolism or thrombosis will then be briefly stated.

It is a question of first interest in connection with the treatment of these three states, so similar although due to different lesions, to know whether they can with sufficient clearness for therapeutic purposes be diagnostically separated. The differentiation is sometimes

one of extreme difficulty, and it has been declared by high authority to be frequently impossible. It can be made with an approach to certainty, and will be of the most importance when the question of such operations as trephining or ligating the carotid artery, or such active and positive measures as bloodletting or windlassing the extremities, may depend on the decision. Etiology often assists in the determination. Age is in favor of either hæmorrhage or thrombosis; comparative youth of embolism; disease of the cardiac valves, particularly if recent, points to embolism, and old kidney disease with hypertrophy of the heart to hæmorrhage. Thrombosis has usually a syphilitic history at its basis, or occurs with the arterio-capillary degenerations of a senile type; but such degenerations are of almost equal significance for hæmorrhage or thrombosis. An attack of embolism is usually of maximum severity almost from the first. Hæmorrhage comes on abruptly in many cases, but its signs and symptoms increase in severity as the blood continues to ooze and spread. The onset of thrombosis is generally more gradual than that of hæmorrhage or embolism. Convulsions and spastic states are more common in hæmorrhage. Hæmorrhage is by far most frequent in the capsular and ganglionic regions of the brain. Embolism attacks both cortical and intracerebral vessels, and one almost as frequently as the other. I cannot, however, go fully into this differential diagnosis, which belongs to other works, but will pass at once to the consideration of the treatment of cerebral hæmorrhage. Even this is a difficult subject to handle concisely—among other reasons because of its local varieties. A consideration of the localization of an intracranial hæmorrhage must to some extent influence prognosis and the activity of treatment, and a local diagnosis should therefore, when possible, always be made.

Hæmorrhages limited to such regions as the cerebellum, the oblongata, the pons, and the crus cerebri have often been recorded. A cerebellar apoplexy is, as a rule, serious and threatening, largely because of the parts which it invades either directly or by pressure. A hæmorrhage into the right or the left cerebellar hemisphere, if restricted to these parts, might be recovered from, and does not necessarily show any localizing symptoms of importance, but those due to invasion or pressure will be paralysis of various cranial nerves given off from the pons and oblongata, and probably incomplete paralysis of the limbs of the opposite side. Among common general symptoms of cerebellar hæmorrhage anywhere situated are vomiting and sometimes retraction of the head and neck with occipital headache. A limited hæmorrhage in one cerebellar hemisphere may sometimes cause absolutely no symptoms. A hæmorrhage, as any other lesion of the middle lobe of the cerebellum, has cerebellar titubation for its distinguish-

ing symptom. A cerebellar hæmorrhage sometimes breaks into the fourth ventricle, causing the same symptoms as a pons-oblongata apoplexy. If the middle or lateral cerebellar peduncle is invaded, intense vertigo and forced rotation of the head will be present.

Hæmorrhage into the pons or into the oblongata is of course a most serious lesion, and usually calls for no treatment, owing to the rapid induction of fatal symptoms. Convulsions are very frequent in lesions of the pons, and the paralytic symptoms will of course vary according to the extent of the lesion. Marked pupillary, respiratory, and temperature phenomena are usually present. When a hæmorrhage of this kind is suspected absolute rest is the only treatment, and any efforts to administer remedies or to try measures which cause the patient to be moved will probably do more harm than good. A hæmorrhage into the cerebral crus, while not as serious as one into the pons or oblongata, should be treated practically in the same way—namely, by carefully letting the patient alone. It will be most likely to cause paralysis of the third nerve on one or both sides, and of the limbs on the side opposite to third-nerve lesion if the latter is unilateral. Various anæsthetic and other symptoms might be present according to the extension of the lesion.

Meningeal hæmorrhages may occur in almost any location, although they are most frequent, whether traumatic or otherwise, from lesions of the middle meningeal artery, and these are commonly associated with fracture. Meningeal hæmorrhage wherever found may be either supradural, subdural, or subpial, although the last is much less common than the first two. The recognition of supradural and subdural apoplexies is of the utmost importance, because they are more amenable than any other forms of intracranial hæmorrhage, and indeed than almost any other active intracranial lesion, to surgical interference. When considering trephining for these hæmorrhages brief reference will be made to their symptomatology. Fortunately, they can be diagnosticated with considerable accuracy even in the absence of external evidences, although these, fortunately also, are most frequently present.

When the treatment of hæmorrhagic cerebral apoplexy is discussed it is chiefly, however, with reference to those varieties which are known as intracerebral. Such a hæmorrhage may take place anywhere within the cerebrum, but commonly the effusion is into or or near the great ganglionic masses. As a rule, it does not start either in the caudate or lenticular body, but, as Gendrin and Charcot have shown, just in contact with the external surface of the latter. Such a hæmorrhage forces its way right and left, and sometimes breaks through the ganglia and internal capsules and inundates the ventricles. From any given attack of intracerebral apoplexy the patient may possibly make

at least a partial recovery if this ventricular invasion has not occurred, and therefore the therapeutics of cerebral hæmorrhage is not without hope.

At the beginning of this article the symptoms of such an apoplexy were briefly stated, but in order to emphasize them they may be repeated here at greater length, as given in a monograph by the writer.

They are at the time of the apoplexy chiefly "loss of consciousness, more or less complete according to the extent of the hæmorrhage; stertorous respiration, sometimes, so far as as the mouth is concerned, one-sided, sometimes also Cheyne-Stokes; temperature at first lowered or afterward rising; pulse sometimes slow and full, sometimes weak and intermittent. Conjugate deviation of the head and eyes may be present, but it is not invariable; it is usually away from the side of the paralysis. It is not infrequently somewhat difficult to determine the full extent and character of the paralysis and loss of sensation, if this also be present, in these cases of apoplexy. Careful inspection of the face, however, will usually show some drooping on the side of the paralysis, and some pulling to the other side. Watching the limbs, the unparalyzed members will be seen to be used by the patient occasionally. The paralyzed extremities when taken hold of are usually limp and offer no resistance, while a certain amount of resistance is offered by the limbs of the other side even though the patient may be unconscious. My experience has shown me that cases of even somewhat extensive extravasation into the capsules and ganglia differ considerably in the amount of paralysis produced. A fuller knowledge of intracerebral localization may eventually throw light upon these differences. In general terms the paralysis of the limbs is usually much more complete than in cases of cortical lesion."[1]

The prophylaxis of apoplexy dependent upon cerebral hæmorrhage is chiefly the treatment of underlying constitutional conditions or diseases and the avoidance of certain particular exciting causes of an attack. Patients threatened with cerebral hæmorrhage in the majority of cases have chronic disease of the blood-vessels, and this in its turn is dependent upon or associated with diseases of the kidneys and heart. Arterio-capillary fibrosis with miliary aneurisms are frequently found in apoplectic cases, as well as chronic nephritis and cardiac degeneration, which has led to hypertrophy and dilatation. Great attention should therefore be paid to nutritive processes and to the functions of the kidneys and heart.

Diet is in such cases of the greatest importance: food should be of a nourishing character, but light and easily digested, and too much of the nitrogenous kind should be prohibited. The mistake

[1] "Cerebral Localization in its Practical Relations," *Trans. of Congress of American Physicians and Surgeons*, 1888.

should not be made, however, of putting such patients upon too low a diet. Hæmorrhages, it is well known, are likely to occur in anæmia, leukæmia, chlorosis, and other diseases of lacking or impoverished blood, and it is important to steer between the two extremes of insufficient food on the one hand and over-supply of improper food on the other. Both extremes will assist in the production of arterial degeneration and in the maintenance of chronic inflammatory and degenerative affections of the kidneys and heart,

The liver, stomach, and bowels should be kept as free from disorder as possible. Constipation should not be allowed, but frequent active purgation should be avoided. Preparations containing such drugs as podophyllin, aloes, strychnine, and belladonna, or cascara compounds, will be found of particular value in many such cases. Patients threatened with apoplexy should be advised moderate exercise, as sedentary habits, particularly if associated with over-eating or drinking, unquestionably aid in the development of nephritis and arterial degeneration.

The functions of the skin and the kidneys should be carefully looked after in accordance with the rules laid down in other portions of this work. Lukewarm baths are of value; but while it is of importance to keep the skin in good working condition, it should not be forgotten that either hot or cold baths may be a source of danger in patients with rigid blood-vessels and organic degeneration of the heart; great extremes of temperature and sudden transitions in bathing should be avoided.

The abuse of alcohol is undoubtedly a potent factor in producing and increasing chronic constitutional conditions which lie at the root of apoplectic attacks. It should therefore either be avoided altogether; or used with the greatest moderation under medical direction, as occasionally small quantities of alcohol seem to be valuable in sustaining the action of the heart and improving the digestive processes.

Overwork, and particularly over-worry of the brain, should be guarded against. While vascular degenerations rarely result from pure intellectual labor, overwork of any kind which tends to flush with blood the cerebral vessels is particularly dangerous when these vessels are diseased from age or special causes. The worries and embarrassments which often go with hard cerebral labor are more harmful than the work itself. Worry is begotten of overwork, and worry means friction and maladjustment of the cerebral powers.

Certain immediate exciting causes of apoplectic attacks may be escaped when—as, however, is seldom the case—enough is known about a patient to apprehend the occurrence of an attack. Straining at stool, violent coughing, sudden exposure to extreme cold, bending over, and constriction of the neck or trunk with tight clothing, all have some influence in the induction of an attack of hæmorrhage. Violent action

of the heart should be prevented or as speedily as possible controlled by rest or medicinal remedies.

Some of the old authorities on apoplexy, as Niemeyer, Tanner, and Lidell, advise special measures for the prevention of apoplexy by changing certain morbid states of the system. Most of these measures are of doubtful general value, and yet almost any one of them may be of some service in a chosen case. For states of general plethora, as prophylactic measures, saline purgatives, the bromides, bloodletting, cold to the head, and the frequent use of derivatives to the extremities have been recommended. Cases are occasionally seen in which such advice is of value, but in spite of the popular view hæmorrhagic apoplexies are more frequent in individuals who present no signs of plethora, but rather the reverse.

At various times special remedies have been recommended as of particular value for cerebral hyperæmia, and therefore as a preventive of apoplexy. Lidell, for example, with certain French observers whom he quotes, strongly advises the use of arsenious acid in doses of about $\frac{1}{20}$ grain, taken three times a day after meals. If such a remedy has any value, it is probably that which arises from its tonic and building effects on the nervous system.

One of the most important matters in the prophylaxis of apoplexy is the careful management of the forerunning diseases of other organs than the brain. Bright's disease, hypertrophy and dilatation of the heart, or valvular lesions must receive careful attention. Aconite or veratrum viride may sometimes be employed, or, on the other hand, small doses of digitalis or strophanthus may be needed. In embolic apoplexy, accompanying endocarditis and valvular disease may require attention. It is necessary in some of these cases to regulate and equalize the circulation at the same time that the patient's general strength is sustained. Digitalis, either alone or associated with drugs such as strychnine or nux vomica, may prove beneficial, and remedies to act upon the skin or upon both the bowels and kidneys may be required for the double purpose of reducing blood-pressure and directly relieving the kidneys.

If called to see a patient stricken with insensibility, and by exclusion or otherwise the diagnosis of intracerebral hæmorrhage has been made, what should be done? In the first place, the patient should be kept as quiet as possible. The amount of hæmorrhage and consequent brain-destruction may be augmented by moving the patient about, lifting him up and down, and turning him over too frequently. The head and shoulders should be slightly raised, but flexion and constriction of the neck should be avoided. Even the physician should be unusually careful in his method of handling and investigating the patient. The clothes should be loosened, so that unusual pressure will

not be exerted anywhere upon the blood-vessels or internal organs. It is sometimes better to cut and destroy clothing rather than to move the patient unnecessarily in removing or loosening it.

Sometimes treatment of the greatest simplicity is overlooked while laboriously but vainly striving to help a patient; and this remark is particularly applicable to one of the most useful of all measures for the relief, and it may be the salvation, of a patient in a severe apoplectic attack. Stertor is one of the danger-threatening phenomena of apoplexy. It is usually regarded as connected in some more or less mysterious way with hæmorrhage into the brain and conditions of arterial tension. Bowles[1] in a recent work on stertor and apoplexy has made some exceedingly valuable practical suggestions with reference to the nature of stertor and its relief. He criticises the views of Strumpell, Nothnagel, and the authors in general who agree with them as to the value of venesection, enemata, and purgatives for apoplexy. He believes that, after all, it is the suffocative symptoms which are relieved by bleeding, and suggests what is certainly a much simpler if equally efficient means of giving relief—namely, turning the patient on his side. I will briefly summarize his views, the practical value and easy application of which are at once evident. On several occasions I have tested their value, although I am inclined to believe that he is too sweeping in his claims for the efficacy of his plan in all cases:

The term "stertor" is descriptive of the sounds in the throat, mouth, or any part of the air-passages produced by the movements of the air during respiration and occurring in apoplectic and like conditions. Bowles distinguishes between several varieties of stertor as the nasal, buccal, palatine, pharyngeal, laryngeal, and mucous. He holds that the stertor of the apoplectic state may be equal in danger to the crowing of the croupy child or the stridor arising from the pressure of a thoracic tumor.

"The accident which determines whether 'the stroke' be or be not accompanied by stertor," he says, "is in most cases due to the patient's happening or not happening to be on his back; or should he exhibit stertor while on his side, there must be some derangement of the ordinary relations of the pharynx, such as the chin being too near the sternum, the existence of a local œdema, long uvula, large tonsils, mucus in the air-tubes, pressure from without, or indeed anything which narrows the respiratory channels or vibrates in their course."

His most important conclusions are that the three forms of stertor which have most connection with the apoplectic state are the palatine, pharyngeal, and mucous; that these three varieties, whatever their remote cause, are the immediate result of a local mechanical condi-

[1] *On Stertor, Apoplexy, and the Management of the Apoplectic State,* by Robert L. Bowles, M. D., F. R. C. P., Lond.

tion—a condition which may always and at once be changed to the great relief of the patients, and sometimes to their permanent recovery; that it is necessary to keep the patient on one side, that that side should not be changed, and that the paralyzed side should be downward.

The question of the use of bloodletting in the treatment of apoplexy is old, and even yet to some extent unsettled. Formerly it was the great resort, and the practitioner who did not bleed his apoplectic patient was regarded as almost guilty of malpractice, while now it is so rarely done that nine-tenths of the practising physicians have probably never bled an apoplectic patient. The chief reason usually assigned for bleeding is to relieve blood-pressure, and especially to diminish intracranial pressure; but Bowles shows that this increase of pressure is often apparent rather than real, and is due to mechanical causes. Some cases of hæmorrhagic apoplexy are probably at the same time instances of general cerebral congestion, and this accompanying hyperæmia may be benefited by bloodletting. Bleeding has been advocated to promote absorption and to exert some sort of styptic action, but little dependence is to be placed on it for such purposes.

Bleeding may do harm in various ways. Although the affection to be treated is an extravasation of blood into the brain, the general condition of the system may be one of anæmia. It is contraindicated when the pulse is soft and the action of the heart is weak and irregular. Position should always be tried first. When bleeding is resorted to, it should be done efficiently, but only in carefully selected cases, for patients, for instance, who, after the side position has been tried, present the general symptoms of cerebral hyperæmia, such as overacting heart, throbbing vessels, full strong pulse, and flushed or turgid face.

Hughlings Jackson refers to the fact that post-mortem appearances in bodies of patients who have died early after cerebral hæmorrhage usually show great engorgement of every part of the lungs, and suggests that bleeding might serve to relieve the embarrassment of the venous circulation, although he does not have much hope of this.

Just as in hæmoptysis styptics and astringents are held to be of value, so no reason would seem to exist why they should not be in cerebral bleeding, yet few recommend such remedies for the latter affection. For pulmonary hæmorrhage a large number of such drugs are still frequently employed, including gallic acid, sulphuric and other mineral acids, erigeron, ergot, preparations of lead, zinc, etc. In some cases these might be worthy of a trial in cerebral hæmorrhage, but the reasons against their use, on the whole, are stronger than those in their favor. Loomis says that it has never seemed to him that styptics or astringents have any control over bronchial hæmorrhage. He relies

rather upon remedies such as aconite and opium, using the former when the pulse is full and strong, and the latter hypodermically when it is weak.

Dawbarn,[1] who refers to this advice of Loomis, speaks of aconite "as bleeding the patient into his own veins," but advocates what he regards as a more efficient way of doing this. "For dangerous and unreachable bleeding anywhere," and therefore for cerebral apoplexy, as well as for hæmorrhage into the lungs, stomach, kidneys, or other organs, his plan is to collect a great portion of blood elsewhere than at the bleeding point until time has been given for a new clot to form, and then slowly allow it time to re-enter the circulation. This sequestration, he holds, if carried to the extent of causing a feeling of faintness, must diminish the blood-pressure at the bleeding point and thus conduce to clotting. Dawbarn argues in favor of the Spanish windlass in many cases of apoplexy, but believes that such local stagnation is not free from danger in careless hands. The limb should be watched and kept well warmed, and the constriction should not be maintained long enough to produce gangrene. The plan is simply to knot a towel or handkerchief around the limb, or if necessary all four limbs, at the junction with the body, and then to twist with a stick until most of the blood is prevented from returning to the trunk.

Dr. William Gilman Thompson,[2] as the result of experiments in the Hoagland laboratory, believes that the strapping of the large veins in the extremities to prevent venous return during pulmonary hæmorrhage has undoubted and immediate effect in lessening the hæmorrhage, and also that such procedure would doubtless tend to relieve extravascular cerebral pressure, but would simultaneously lessen the intravascular pressure, and the latter would be affected to a greater degree and more promptly, tending to give the hæmorrhagic blood time to clot.

"The reason for this would be that the extravascular pressure would be dependent somewhat upon conditions of absorption and osmosis, which would act more slowly than the almost instantaneous effect of withdrawing blood from the heart by damming it back in the extremities."

Dawbarn contends, therefore, that whenever there is bleeding enough to threaten life, and not within reach of direct pressure nor of the artery clamp, our main reliance should be the tourniquet or windlass, generally placed upon all the limbs. He makes the following interesting suggestion, which we will give in his own words, which are certainly put in a very practical shape:

"I need hardly say that promptitude and the ounce of prevention may here save a pound of blood. Given a case where bleeding from

[1] Dawbarn, New York *Med. Record*, vol. xli., No. 1, Jan. 2, 1892.
[2] Letter to Dr. Dawbarn in *Med. Record*, Jan. 2, 1892.

the lungs or stomach has already occurred, or given a patient where family history, atheroma, high living, and attacks of cerebral congestion (perhaps with one or two slight strokes already sustained) point to apoplexy as the probable end of the story, we should make it a rule to show the relatives, privately, how to make and use the windlass. As to apoplexy, we should say to them: 'If ever Mr. A—— becomes suddenly unconscious, then, unless his face is pale and his pulse weak, put on the windlass instantly, tightly enough to make the limbs swell. Do this even before you send for the nearest doctor. Do not leave these bands on longer than an hour.'"

The use of derivatives and of hot applications to the extremities is a treatment for apoplexy as old as bloodletting, and one perhaps of more practical general value. Hot water or mustard plasters may be applied to the feet, but care should be taken that the patients are not scalded or blistered in this way, as their insensibility may prevent them from recognizing painful impressions. The great cupping-glass apparatus known as Junod's boot has been recommended in cases of apoplexy, but usually Junod's boots are not to be had, and their efficiency has not been so proved as to justify the average physician in keeping them on hand. The use of ordinary derivatives, however, has something to justify it, and in its favor is the fact that it is a method likely to be appreciated by the friends and family of the patient.

Cathartics, like bloodletting, act to reduce arterial pressure, and they may be used both for this reason and to put the intestinal tract in a more healthful state, and to obtain a derivative effect in this way. Croton oil is an old and good remedy still much in vogue in the treatment of apoplexy. Hughlings Jackson states that he never prescribes any medicine but croton oil by the mouth. Usually two or three drops with a little sweet oil are placed on the tongue. Croton oil has the advantage of rapidity and certainty of action and comparative facility of administration. Elaterium may be used instead of croton oil.

The administration of cathartic medicines by the hypodermic method would be a decided help in some cases of apoplexy, as this could be done when the patient could not swallow, and the movement required in order to give an enema, which might add to the danger of the patient, could be avoided. I do not, however, know of any practical method of doing this.

Stimulants are to be resorted to when cardiac and respiratory paralysis is threatened, as shown by feeble heart, weak and rapid pulse, Cheyne-Stokes breathing, and similar phenomena. The stimulants used may be either local or constitutional. Of the former might be mentioned the direct application of cold water to the chest or the nape of the neck, irritation of the skin by mustard or other local irritants, or

even the use of the faradic brush to the hands or feet. Ammonia may be given either by the nostrils, by hypodermic injection, or even internally. Some preparation of musk, or even whiskey or other alcoholic stimulant, may be given in whatever way is most convenient. As a rule, practitioners do not resort to methods of this kind, which usually do but little good, and yet cases occasionally are seen in which consciousness is restored and recovery from an apoplectic attack brought about by such measures.

If arterial tension is much diminished, and especially if this condition persists, in addition to the remedies mentioned others, such as caffeine or camphor, may be used. When the heart sounds are weak and irregular it may be advisable to use remedies like strophanthus, to which may be added small doses of nitroglycerine to lower peripheral resistance.

Ergot is a remedy which has several theoretical considerations in its favor, but certain others which are decidedly against its use. Wood, for instance, considers that by increasing blood-pressure its tendency is rather to do harm than good in apoplexy, although it may be advantageously used in cerebral congestion.

Both food and medicine may be administered by the rectum when the patient cannot swallow, but life is prolonged. The mouth should be kept as free as possible from secretions.

Such accompanying phenomena as convulsions may require particular attention. Bastian has recorded a case in which an injection of 30 grains of chloral into the rectum appeared to stop the convulsions. Vomiting may also demand especial attention, as it, like convulsions, may serve to increase the hæmorrhage.

The treatment of an apoplectic attack cannot be entirely separated from a consideration of the causes and conditions which occasion it. Frequently it occurs in a patient suffering from nephritis and its accompaniments, such as hypertrophy or dilatation of the heart, with rigid arteries and abnormal urine. In such a case, although the attack may not be a uræmic but a true apoplectic seizure, remedies should be directed both to the relief of the apoplexy and of the other conditions. If a patient has had one apoplectic attack from which he partially recovers, he should afterward pay strict attention to hygiene, remembering the likelihood of another attack. The remarks on prophylaxis are here applicable. Life should be kept as free from hurry and care as possible; food should be sufficient, but easily digested; and the bowels and kidneys should be regulated as absolutely as possible.

At this time, when trephining is so frequently resorted to, the operative treatment of several forms of hæmorrhagic apoplexy is well worthy of brief consideration. Some of the most brilliant results in

intracranial surgery have been obtained from operations for intracranial hæmorrhage, although it is true that the successful cases have been usually traumatic in origin and extracerebral in position. I have elsewhere considered this subject at length.[1] Intracranial hæmorrhage may be either supradural, subdural, cortical, subpial, or intracerebral. Supradural and subdural hæmorrhages are almost always the results of injuries, and when their existence can be clearly made out trephining and removal of the clot may often be successful, a fracture when present being of course at the same time treated. Such hæmorrhages are most frequently from the branches of the middle meningeal arteries. Deaver[2] has reported several interesting operations of this kind, all the cases being of traumatic origin. The chief symptoms of supradural hæmorrhage are dilatation of the pupil, usually on the side of the apoplexy, and contralateral paralysis, when, as is usually the case, the bleeding is over the motor area. Among general symptoms are complete or partial unconsciousness, often giving way for a time to a conscious or lucid state, stertorous or Cheyne-Stokes breathing, variable pulse, dependent upon the extent and severity of the hæmorrhage. Often either legs or arms or both are spastic, and jerking movements or even general spasms may occur.

The symptoms of subdural or intrameningeal hæmorrhage do not differ much from those of the extradural variety; the general symptoms are certainly much the same. Owing to the frequent bruising and tearing of the brain surface cortical or Jacksonian spasm is more likely to occur, although the convulsions with either variety of hæmorrhage may be what are termed dural in character—that is, more or less general—and both clonic and tonic, but with a predominance of the clonic element. Cases have been recorded of clots over the motor area, with or without a history of injury, causing rhythmical motions of the other side of the body. The diagnosis of meningeal hæmorrhage should therefore be carefully made with operative treatment in view. Subdural or intrameningeal hæmorrhages are nearly always also cortical, but occasionally a hæmorrhage is poured out beneath the inner membrane, and may be particularly classed as cortical or subpial. Not a few of the cases of spastic or epileptic hemiplegia in children begin in this way, and operation promptly performed might sometimes prove a saving measure.

Even in the absence of external evidences of injury successful trephinings for supra- and subdural hæmorrhages have been reported. Such operations should be performed promptly, the localizing diagnosis having been made. The localizing rules are the same as for other lesions, except that it is necessary to bear in mind the symptoms

[1] "Cerebral Localization, etc.," *Trans. Congress Am. Phys. and Surgeons*, 1888.

[2] *Annals of Surgery*, June, 1891, and *Journ. Nerv. and Mental Dis.*

which result from involvement of the dura mater as well as of the pia-arachnoid and cortex.

Even for intracerebral hæmorrhage—that is, where the extravasation has taken place within the substance of the cerebrum or in its ventricles—the question of trephining to remove the clot is worthy of some consideration. In one or two cases operation has been successfully performed for ventricular hæmorrhage, and the fact that recovery has occurred in rare cases of primary ventricular hæmorrhage is a reason for considering the practicability of trephining in such cases. Such operations have been advocated by Gray,[1] Dana,[2] Lanphear,[3] the writer,[4] and others, while strongly opposed by some authorities. In 1883, Macewen[5] removed a clot from the white substance of the motor subcortex. On several cadavers I made experiments to see if intracerebral extravasations could be reached by trephining. This could be done by entering the temporal lobe low down and well back, so as to avoid the Sylvian fossa and the island of Reil. According to Dana, in order to reach a common form of ingravescent hæmorrhage the best place to trephine would be a little below and in front of the parietal eminence. The surgeon should then explore downward and forward, care being taken not to injure the terminal branches of the Sylvian artery, which are in this neighborhood. In cases of ingravescent apoplexy surgical interference, if undertaken, should be before the blood broke into the ventricles. This, Dana believes, can be determined by the sudden increase in the severity of the symptoms, and, if the blood is poured in rapidly, by contractures on the paralyzed side.

My own observations show that when a hæmorrhage reaches the ventricles, the unconsciousness becomes, if possible, more profound, the complete unilateral paralysis becomes general, all sensory response is absent, tremulous and spasmodic movements affect both sides of the body, and the Cheyne-Stokes type of breathing persists. Various practical questions arise with the subject of trephining for intracerebral clots, particularly when deeply situated. It has been suggested, for instance, that it might be impossible to remove the extravasation on account of its having formed a firm coagulum. It does not always do this. Within one week I saw two cases of intra-encephalic hæmorrhage, in one of which the cavity was filled with a firm clot, and in the other the blood was entirely fluid, although the patient had been dead more than twenty-four hours. The reason of this difference I do not know, but in hæmatocele, no matter where situated, when not in contact with the air the blood is sometimes coagulated and some-

[1] *Annual Univ. Med. Sci.*, 1891, vol. ii.
[2] *Journ. Nerv. and Ment. Dis.*, vol. xv. No. 10, Oct., 1890.
[3] *Am. Journ. Surg. and Gyn.*, vol. ii. No. 6, Jan., 1892.
[4] *Trans. Cong. Am. Phys. and Surg.*, Sept., 1888.
[5] *Lancet*, London, Aug. 11, 1888.

times not. Even though blood is coagulated, it might in some cases be removed by carefully enlarging the opening made by the knife to reach the seat of the hæmorrhage with flat retractors, and then extracting the coagulum in fragments with forceps or spoon. The bleeding in cerebral hæmorrhage probably ceases because of the retraction of the vessel and the forming of a small coagulum in it, but of course the danger of producing a fresh or renewing an old hæmorrhage should be considered. If such operations are resorted to, care should be taken not to move the patient more than is absolutely necessary.

Victor Horsley,[1] at the International Medical Congress, Berlin, 1890, made the bold suggestion that in hæmorrhage from the ventriculo-striate artery, the ordinary form of cerebral hæmorrhage, ligature of the common carotid artery should be performed. He advocates this heroic measure on the ground that position, bleeding, etc. are of little or no effect in checking the hæmorrhage, and that the consequences of the apoplexy, such as hemiplegia, and even death, vary directly with the number of fibres torn through by the hæmorrhage. He believes that the hæmorrhage can be checked by arrest of the carotid stream by ligature or compression. Experiments performed by him, in conjunction with Mr. Spencer, determined that ligature of the common carotid not only arrests the flow of blood from the ventriculo-striate artery, but in a few minutes also even from the middle cerebral. He believes that no serious effects are likely to result from the operation if asepsis is perfect. I am not aware that this suggestion has yet been carried out in practice. It should be done within three or four hours after the attack. Opposed to it is the great difficulty of determining that an apoplectic stroke is due to hæmorrhage or embolism, but in some cases the diagnosis can be made with an approach to certainty. According to William Gilman Thompson, already cited in connection with the paper of Dawbarn, ligating the carotid or the vertebral arteries has no very decided effect upon the amount of fluid contained in any of the cerebral tissues, while, of course, the pulsations of the brain cease and the intravascular cerebral pressure falls. In rare cases, where the diagnosis of the cerebral hæmorrhage is made with certainty and the patient is seen early, such an operation would be justifiable.

When a patient does not succumb at once or speedily to the apoplexy, after a period usually varying between twelve and twenty-four hours, a rise of temperature often takes place, or if recovery is not likely, the temperature may remain stationary or nearly so until death. In the cases which tend to recovery consciousness may begin to return with or before the febrile phenomena, which include in some instances delirium. The patient may complain of headache and of pain in the paralyzed limbs, and may be apathetic, gloomy, confused, or even

[1] *Brit. Med. Journ.*, vol. ii., Dec. 6, 1890.

semi-stuporous. It is commonly supposed that symptoms such as these are due to inflammation of the tissues in the vicinity of the clot, and it is just as well to direct the treatment with this idea. Local bloodletting to the temples or back of the neck is sometimes a useful procedure, as may also be the application of cold to the head by means of an ice-bag or wet cloths. The bowels should be kept gently opened, and the bromides, hydrobromic acid, chloral, sulphonal, and even opiates in moderate doses, may be used with advantage to allay the symptoms of excitement. For the cerebritis or meningitis calomel and other preparations of mercury may be given with the narcotics and sedatives. Calomel in minutely divided doses may serve to carry out several valuable indications.

Not much need be said of the treatment of apoplexy due to cerebral embolism as distinguished from that dependent upon hæmorrhage. To avoid such attacks the patient should be carefully guarded against everything that would disturb the circulation or heart-action. Any acute symptoms in the course of rheumatism, of the puerperal state—or of the various infectious diseases, such as scarlet fever, diphtheria, and influenza—which lead to endocarditis, should be carefully considered and treated. Venesection is not called for in cases of cerebral embolism; and stimulants and heart tonics may be temporarily of service, assisting in the establishment of collateral circulation. Such remedies are, however, sometimes contraindicated, especially if the patient is seen early and the heart action is labored and irregular. In such cases one of the bromides may be administered with advantage either by the mouth or by the rectum in doses of from 20 to 40 grains; and even aconite and veratrum viride may prove serviceable in regulating the circulation. Little or nothing can be done in the way of removing emboli from the vessels; and unless collateral circulation is fully and freely established early, some softening of brain-tissue takes place, and this cannot, of course, be removed by treatment. Affections of the bladder and bowels, bed-sores and ulcers, and similar troubles, are present in cases of embolism, as in hæmorrhage, and must receive similar care. In the treatment of cerebral thrombosis it is highly important to bear in mind the enfeeblement of the circulation, resorting, if necessary, to nutrients and stimulants.

Probably in the majority of cases of thrombosis the remedies of most service near the time of the attack are cardiac stimulants like strophanthus and caffeine, and vasodilators like nitroglycerine. In cases of marantic thrombosis resort may be sometimes had to normal salt solution, or even to transfusion. In rare cases an imminent attack of thrombosis may be averted by similar measures. Such attacks may be indicated by recurring spells of vertigo, anginal pains,

irregular action of the heart, and a distressing sense of weakness with numbness or partial loss of power in one or more of the extremities.

The use of oxygen has been recommended to tide the patient over an apoplectic attack, and it is conceivable that patients with dyspnœa and cyanosis, in which change of position has failed to correct the threatening conditions, may be sustained for a period or some of the effects of shock be removed by the inhalation of the gas. It is possible that in serious attacks of embolism, more than in either hæmorrhage or thrombosis, such a method of treatment might be useful. Cases of embolism of the pulmonary artery have been reported in which the patients were thus sustained until recovery was assured.

The treatment of the bed-sores and ulcers which are not infrequently left requires to be carefully considered. Such eschars sometimes occur on the buttock of the paralyzed side without any reference to pressure or uncleanliness; they are vaso-motor and trophic affections, dependent like the paralysis and other symptoms upon the apoplexy itself. Such sores or ulcerations require to be treated with poultices or alternate hot and cold applications and various antiseptic dressings. Among the remedies most useful are carbolized washes or carbolized oil, iodoform powder, and injections or applications of the peroxide of hydrogen. In a patient in the recovering stage from an apoplexy or during the hemiplegic period, particularly its earlier part, strict attention should be paid to the condition of the bladder and the bowels and to the effects of their involvement. Involuntary evacuations both from bowels and bladder often occur, and, on the other hand, both bladder and bowels may be distended, injured because of paralysis of their walls. Catheterization or the use of enemata should be resorted to if necessary. If cystitis develops, or to prevent its development, the bladder should be treated both by external applications and by internal remedies, and if necessary it should be carefully washed out with antiseptic solutions.

The permanent symptoms usually left after an apoplexy are such as motor paralysis, anæsthesia, aphasia, and certain vaso-motor or trophic states in the paralyzed limbs. Little can be done by drugs to affect the lesions directly, although the iodides and ammonia preparations may be of some value for the promotion of absorption and in the improvement of the chronic disease of the vessels. Electricity, in the form of either faradism or galvanism, will prove of some service in restoring the limb to the highest degree that the brain lesion will permit. The paralysis is sometimes more pronounced than the lesion necessitates. No good will result, however, from prolonged and persistent treatment with electricity. Massage and Swedish movements are to be used on the paralyzed limbs with the same object as the electrical

current—namely, to improve circulation and nutrition and attest how far improvement can take place. The aphasia which often follows an apoplectic attack can in some cases be improved by persevering training.

INTRACRANIAL TUMORS.

Intracranial tumors are of many varieties both as to structure and as to location, and as the only methods of treatment for these growths which offer any hope are surgical procedures and remedies for constitutional infection, it is necessary first to glance briefly at these varieties.

In the article on "Tumors of the Brain and its Envelopes," in the *American System of Practical Medicine*, by Dr. Lloyd and the writer, are presented in tabular form the pathological varieties in 100 cases of brain tumor, as follows: Carcinoma, 7; cholesteatoma, 1; cyst, 2; echinococcus, 2; enchondroma, 1; endothelioma, 1; fibro-glioma, 2; fibroma, 4; glioma, 16; glio-sarcoma, 1; gumma, 13; lipoma, 1; myxo-sarcoma, 1; myxo-glioma, 2; osteoma, 2; sarcoma, 15; tubercle, 13; unclassified, 16.

Gowers[1] groups intracranial growths in what he believes to be the order of their frequency, in six categories: I. Diathetic—tubercular and syphilitic; II. Sarcomatous—glioma, sarcoma, myxoma; III. Carcinoma; IV. Osteo-fibroid—fibroma, osteoma, osteo-fibroma; V. Miscellaneous—cholesteatoma, lipoma, vascular or erectile tumors, psammoma, neuroma; VI. Parasitic—echinococcus and cysticercus.

In the table of Lloyd and the writer, which was of selected cases, it happens that gliomata, gummata, sarcomata, and tubercular tumors are represented by nearly the same percentages. Gliomata and sarcomata rank a little ahead of the other two, but these numbers probably do not represent correctly the ratio of the different forms of growths. Gowers is more nearly correct when he says that, excluding syphilitic growths, tubercular tumors constitute more than half the number of cases, and gliomata and sarcomata together about a third, gliomata being rather more frequent than sarcomata; and thus the two groups, tubercular and sarcomatous, constitute about four-fifths of non-syphilitic tumors of the brain. Knapp,[2] to whom we are indebted for the most recent monograph on intracranial growths, a valuable contribution from an analysis of Bernhardt's 485 cases, of Birch-Hirschfeld's 314 cases, of Starr's 299 cases occurring in children, and of 40 personal cases,

[1] *Diseases of the Nervous System*, p. 871.

[2] "The Pathology, Diagnosis, and Treatment of Intracranial Growths," *Fiske Fund Prize Dissertation*, No. xli., Boston, 1891.

concludes that tubercle is the commonest form of intracranial growth; next the two connective-tissue formations, sarcoma and glioma, with their varieties; and next, with a long interval, gumma, cancer, and parasitic cysts, other forms being exceptional.

The varieties of tumor which offer the most hope of success from operation probably are, in the first place, the osteo-fibroid class, which includes the fibromata, osteomata, and osteo-fibromata, intracranial tumors which undoubtedly frequently result from injury to the skull, sometimes the traumatisms long antedating the earliest observed symptoms of tumor. Agnew places cysts and gliomata next to fibromata. To empty a cerebral cyst is usually, however, of little use, for the simple reason that it will fill again. Opposed to operation upon a glioma is the fact that it is nearly always infiltrating in character. Probably the cases known as fibroid-gliomata, which are rare, and are the most distinctly separable from the brain-tissue proper, are for this reason more operable. In favor of operation on gliomata is the fact that they are not usually multiple. On the whole, if the location and nature of a gliomatous tumor could be made out and its size and region did not prohibit operation, trephining for its removal would be justifiable, because of its incurability by medication and of the possibility of preventing its further spread by operation; but brilliant success cannot be hoped for from operations on tumors of this character.

The weight of opinion seems to be against operation for sarcomata and carcinomata, whatever may be their varieties, the opposition being based upon their tendency to infiltrate, to be multiple, and to recur; but a few special words may be said about the varieties of sarcomata. The advisability of operating depends largely upon the situation and probable isolation of the growth. Recently I saw two cases which illustrate the points necessary to make in coming to a conclusion. One was a patient in whose case amputation of the arm at the shoulder-joint had been performed because of an osteo-sarcoma, but who a few weeks later, after short initial symptoms, developed a gradually augmenting hemiplegia, with some associated hemianæsthesia, and in whose case a careful study indicated the strong probability of sarcomatous infiltration of the internal capsule and corona radiata of the cerebrum. In such a case operation would be clearly inadmissible, even though the growth were presumed to have well-defined boundaries. The other case was that of a man who, previously in good health, was seized two years before coming under observation with an attack of unconsciousness, associated with spasm. He had had several similar attacks, some of them positively epileptic in character, others simply of dazing or vertigo; tinnitus was the only symptom preceding the first attack, and this had continued and increased and was associated with some failure of hearing. Decided tenderness began to show itself

in a crescentic and augmenting area above the left ear, gradually became more and more decided, and slight weakness was soon present in the right upper and lower extremity. The patient had received two or three severe blows on the head several years before. The diagnosis of osteo-sarcoma or osteo-fibroma was made and operation advised.

Notwithstanding, then, the tendency to infiltrate, to be multiple, and to recur, when the desperate, painful, and inevitably fatal character of these affections is considered, if a sarcomatous tumor can be localized in bone or membranes or in both, operation is not only justifiable, but in the early stages of the affection it should even be urged. No harm can be done if the operation is skilfully and carefuly performed, and the patient may at least be saved some suffering and be given a longer lease upon life. In this case, as in other cases of brain tumor, operation if it is done at all should be done early.

Occasionally trephining should somehow be performed for syphilitic growths, because such growths occasionally resist the most active antisyphilitic treatment, at least one reason for which is that supplying blood-vessels have been obliterated by the advancing tumor, so that remedies can no longer reach the growth, and they therefore practically become inert foreign bodies. Authorities differ as to the advisability of removing syphilitic growths, but all are agreed that energetic medicinal remedies should be employed in the form of mercurials and iodides before interfering surgically.

It may seem strange to advocate the removal of tubercular tumors, and certainly such an operation would only be justifiable in the very rare case in which the diagnosis of an insolated tyroma had been carefully made, and in which the evidence was against the existence of tuberculosis in other organs than the brain. Gowers says that "occasionally these growths (like bone disease) may be the sole lesion, and hence they are sometimes called 'scrofulous' tumors, but of their tubercular nature there is no doubt. They compress the brain tissue, which atrophies before the growth; they do not infiltrate like some other tumors. They generally occur within the cerebral substance, without connection with the membranes; very rarely a small growth springs from the pia mater. Now and then they spring from the dura mater, and merely compress the brain without invading it."

Cysts which are the remains of destroying lesions, such as clots, softening, gliomata, sarcomata, and the like, offer no inducements to operation. As in porencephalus and hydrocephalus, which are in fact cysts of larger size, the objection to operation is that the contents of these cysts are compensatory and protective, and that if operation is performed and the cysts are drained they will either fill again or harm may result from the disturbance of the balance within the skull. Multiple small tumors, such as the psamomata, cholesteatomata, and multi-

ple cysts, such as cysticerci, are of course beyond the pale of operation because of their multiple character. Hydatid cysts may be between the membranes or even outside of the dura mater, although they are usually found deep in the brain: as hydatids are usually single, if they could be localized in an accessible area trephining might be considered.

Summarizing, it will be seen that, so far as the nature of the growth is concerned, in favor of operation are the single or solitary character of the growth; that it is not infiltrating, and not likely to recur; that it is not multiple; that it is not too large; and that appropriate remedies have been used thoroughly and without success.

Agnew[1] in his address before the American Surgical Association at the Congress of American Physicians and Surgeons, held in Washington in September, 1891, gives with comments a table of five operations done by Philadelphia surgeons for brain tumors. The results were not brilliant, although in one of the operations, by Keen, a tumor which weighed four ounces was shelled out of the brain, and the patient has since had great relief from spasms and pain, many of the destructive results produced by the tumor remaining. Dr. Agnew concludes as follows with reference to operation considered from the standpoint of the structure or nature of the growth: "If tubercular in character (and nearly one-half are of this nature, especially in young subjects), they are likely to be multiple, and consequently offer little prospect for successful operation, as the history of such cases proves. If the growth should be a sarcoma or a carcinoma, their magnitude, with the inherent tendency of such to infiltrate and disorganize the surrounding brain tissue, renders all attempts at extirpation uncertain, often improbable, and rarely successful. In Starr's collection of brain tumors, amounting to 300 in number, only 19 would have justified an attempt at removal. The cases which appear most amenable to operative interference are fibromata springing from the dura mater, cysts, and gliomata."

Of course, in view of what has just been said, the diagnosis of the nature of the growth becomes of prime importance, and unfortunately this is usually a matter of great difficulty. In some parts of the brain certain forms of growth are known to be more common; thus, according to Seguin and Weir,[2] the cerebellum appears most prone to cystic formations, often as secondary developments from a sarcomatous tumor. According to Knapp, in the cerebellum growths are more apt to be tubercular, and in the white substance of the cerebrum sarcomatous or gliomatous, while multiple growths are more commonly tubercular or syphilitic. The following remarks of the

[1] *University Medical Magazine*, Oct., 1891.

[2] *American Journ. Med. Sci.*, July, Aug., and Sept., 1888.

same author briefly summarize our knowledge, or rather our lack of knowledge, on this subject: "Certain other symptoms may give us some help. The discovery of a cancer or sarcoma in other organs may lead us to suspect a metastatic deposit in the brain. The presence of a marked cachexia strengthens this suspicion. Evidences of tuberculosis elsewhere, or of a tubercular diathesis, or symptoms of syphilis, may help us in our diagnosis. A denial of previous syphilis is of course of little value. The age of the patient may also be a guide, tubercle being especially common in young subjects. Heredity may throw a little light, especially with cancer and tubercle. So far as the actual symptoms of tumor go, they give comparatively little help. Frequent apoplectic attacks and a moderately slow progress are said to point to glioma."

Of course the location of a growth is of vital importance in deciding as to the probabilities of its successful removal. In a paper read before the Congress of American Physicians and Surgeons in September, 1888,[1] I fully considered this question, arriving at conclusions which are there stated as follows: "The lateral aspect of the prefrontal lobe, the entire motor area, the superior and inferior parietal lobules, and the upper temporal region can, of course, be attacked with the greatest facility. In the regions difficult yet possible of access lesions of large size and of displacing character will be more readily reached. The orbital surfaces of the prefrontal lobe can be reached and large displacing lesions removed by trephining low down in the frontal bone. In Durante's case the tumor removed occupied the left anterior fossa of the cranium. Almost the entire temporal lobe, with the exception of the parts bordering on the mid-brain, is accessible. The occipital lobes have been operated upon successfully. With care the great median fissure may be entered for lesions of the marginal convolutions and limbic lobe. The longitudinal sinus has been successfully plugged and ligated. The outskirts of the ganglia have been approached and the ventricles have been pierced. Even a tumor situated on the intracranial portion of the auditory and facial nerves can probably be reached and removed. Suckling and Jordan, Bennett May, Horsley, and Weir have looked during operation with the eyes of the flesh on the foramen magnum itself. Absolutely inviolable, then, are only the middle region of the base and its bordering convolutions, the corpora quadrigemina and pons oblongata."

Knapp[2] gives the most complete list yet published of operations for cerebral tumors. One of these tables includes 46 cases of trephining with removal of an intracranial growth; the other 26 cases of trephining in which a growth was not removed. He gives a summary of both

[1] *Trans. Congress Am. Phys. and Surgeons*, Sept., 1888. [2] *Op. cit.*

of these tables, which, because of its value in assisting the physician to a decision as to operation, I will reproduce:

Tumors of—	Recovered.	Died.	Unknown result.	Total.
Prefrontal region	2	1	0	3
Central region	22	6	1	29
Parietal region	2	0	0	2
Occipital region	0	1	0	1
Cerebellum	2	3	0	5
Unknown location	2	4	0	6
Totals	30	15	1	46
Tumors not found at the point of operation	2	13	0	15
Tumors which could not be removed	1	3	0	4
Trephining to relieve increased intracranial pressure	7	0	0	7
Totals	10	16	0	26
Grand totals	40	31	1	72

When recoveries are spoken of, it is not always to be understood that the patient was relieved of all symptoms or was restored to a normal condition. It means, in the first place, that the patient survived the operation; secondly, that in some cases such terrible symptoms as the agonizing headache and uncontrollable vertigo and vomiting were relieved; and, thirdly, that in a very small percentage of cases full recovery was practically obtained. Even, however, with paralysis, anæsthesia, deafness, hemianopsia, or blindness left behind, the last condition was better than that before the operation.

Horsley[1] at the International Medical Congress at Berlin in 1890 suggested in cases of inaccessible or malignant growths or in cases in which there are no focal symptoms, yet where the patients suffer from intense headache or from other symptoms of increased intracranial pressure, the propriety of trephining to relieve pressure. He obtained beneficial results of this character in six cases. In one case of Knapp's headache was much relieved by the operation, although no tumor was found. Of course such treatment is only palliative, but palliation is much in a disease which produces the agony of brain tumor.

While, therefore, as yet the literature of the subject shows but few brilliant or even favorable results from trephinings for the removal of intracranial tumors, the future will probably give us an occasional great triumph. The cases have been too few for us to draw positive conclusions. Experience has abundantly shown that the brain-case can be opened with impunity, and in the vast majority of cases, when proper

[1] *Brit Med Journ.*, vol. ii., Dec. 6, 1890.

skill is used and proper precautions are taken, without danger to the life of the patient. Serious as is the operation for brain tumor, some cases have recovered from the effects of the operation, and their lives have been rendered more endurable even when a cure has not been achieved. This was notably true of the patient from whom Dr. Keen removed a tumor weighing four ounces. With such facts before us and with further additions to our localizing powers the day will come when we can confidently look for the successful removal of some intracranial growths. The importance of not postponing operations too long cannot be too strongly emphasized, as one of the most serious errors has been that even accessible and removable tumors have as a rule been left far too long before operation was attempted. Theoretically the use of the mallet and chisel in the osteoplastic operations for the removal of brain tumor would seem to have objections, especially because of the shock produced by the concussion caused by the severe hammering. My own predilections were rather opposed to this method of operating, but I have seen several cases successfully operated upon by this method without untoward results. When the bone is thick it is sometimes a good plan to make small trephine openings and partially saw the flaps with a Gigli saw.

Lumbar puncture has been suggested, and in a very few cases employed as a palliative measure in the treatment of brain tumors. Probably it does something toward reducing extreme intracranial pressure. A few experiences have shown that it is attended with special dangers in cases of cerebellar tumor.

The medicinal treatment of intracranial tumors presents but little encouragement, and yet some efforts with medicine should always be made. Syphilitic growths of course offer the most hope of successful treatment, and this treatment should be pursued with some definiteness of purpose and plan. Among neurologists and syphilographers some differences of opinion have prevailed with reference to the advisability of using mercury or iodides or combinations of these drugs. Probably no rules can be laid down which will be of uniform value in the decision of this question. Every case must be studied for itself, and almost every case will be experimented upon with both drugs. If called in to see a case of syphilitic brain tumor at a presumably early stage, resort should first be to active treatment with mercury or with mercury and the iodides combined, ordering, for instance, the protiodide or biniodide to be rapidly increased. This not succeeding, or perhaps at first, mercurial inunction with about ½ drachm of blue ointment, three times daily, at the same time giving from 30 to 60 grains of iodide of potassium or iodide of sodium, three times daily, should be tried. I prefer always to give the sodium salt a trial, although the iodide of potassium may sometimes prove the most

useful. The combination of mercurial inunction with the iodide treatment, both in full doses, is sometimes promptly successful.

Mercurial inunctions should be performed with attention to detail, as in other forms of syphilis, and we cannot do better than to quote here the advice of Heubner. "It is advisable," he says, "to let the patient take warm or sulphur baths for a few days before the treatment is begun, in order to promote the capillary circulation of the skin; before each inunction also a bath should be taken or the parts to be anointed at least washed off. The doses to be used in each inunction must be larger in these than in milder cases. We usually order, during the first fourteen days, from 3 to 4 scruples of mercurial ointment, to be rubbed in daily in the usual manner on the lower and upper extremities, the abdomen, and back successively. After this, if an amelioration of the symptoms be noticeable, the same dose is repeated every other day for several weeks, and then half this dose is used at the same intervals for several additional days and weeks according to the course of the affection. With regard to the duration of the treatment, a special warning must be uttered here against a premature discontinuance of it: a return and an aggravation of the affection are too often observed shortly after an interruption of the treatment. In connection with this Yvaren very truly says, 'The treatment must be as obstinate as the disease.' The physician must not lose patience. In general it is advisable to continue the inunctions at least fourteen days after the graver symptoms, such as the disturbances of intellect, the loss of power, or the spasmodic attacks, etc., have disappeared. Moreover, if there be the slightest indication of an aggravation of the affection, a new course of treatment must be commenced. The advice of Sigmund to keep the mouth and teeth scrupulously clean must be carefully complied with, in order to prevent salivation, which would necessitate an interruption of the treatment at too early a period. When the patients are unconscious this duty will devolve on the nurse."[1]

The hypodermic employment of mercury can be resorted to in some cases both of tumor and meningitis, whether cerebral or spinal, with brilliant results. Various preparations of mercury have been used by the hypodermic method, chiefly for the early symptoms of syphilis, but both late secondary, and even tertiary, cases have also yielded to this mode of treatment even after other methods have failed. Wolff[2] of Philadelphia, carefully reviewed this subject in 1889. The most permanent results have been obtained with inunctions of blue ointment, calomel injections, and corrosive-sublimate injections. On the whole, the treatment by corrosive sublimate has proved the most efficient. The solution employed by Wolff contains 1 part of corrosive sublimate

[1] Heubner, *Ziemssen's Cycl. Pract. Med.*, Am. ed. vol. xii, p. 367.

[2] *Therapeutic Gazette*, Nov. 15, 1889.

dissolved in 100 parts of distilled water, of which from 12 to 20 minims are injected daily deep under the skin into the connective tissue in the region of the back, from above and below the scapula, down to the gluteal region on both sides and on the sides of the chest. In his cases twenty-five to thirty injections were made successively, the doses being gradually increased until slight gingivitis was experienced, when the amount injected was diminished until it had disappeared. An after-treatment with small doses of potassium iodide or Blanchard's pills of the iodide of iron was continued for three months or longer, the iodides preventing or retarding the elimination of mercury. A gold needle fitted to an ordinary hypodermic syringe encased in hard rubber can be used, or a steel needle well anointed will answer if properly cleaned and changed as often as corrosion indicates this necessity. In a case about which I was consulted by Dr. C. S. Turnbull the symptoms of brain-tumor disappeared under such injections.

More advanced cases, or if the practitioner prefers, any case of syphilitic tumor, may be placed at once upon comparatively large doses of iodide of sodium or iodide of potassium, which should be increased if no bad effects result from its administration, until enormous doses are taken after the so-called American fashion. The treatment may be begun with 30 grains of the iodide given three times daily, increasing the dose each succeeding day by 5 or 10 grains until 120 or even 180 grains are taken three times a day. In a few cases it is surprising not only how well the patients stand these enormous doses, but how much they improve under them. That a patient with syphilitic brain-tumor has not improved under a previous treatment with the iodides should not always discourage us, as it happens occasionally that renewed treatment gives good results or that the former treatment has not been sufficiently aggressive.

The treatment of brain tumors—and the same is true of spinal tumors—is of course often in part the treatment of the accompanying meningitis, but as both the growth itself and its accompaniments are practically to be best treated by the same measures, and as I have already especially discussed meningitis, it will not be necessary to discuss it here. The nausea and vomiting, the headache, the vertigo, the spasms local or general, the hyperæsthesia, and other symptoms which may be referable either to the tumor or to the meningitis, or to both, are to be treated by local depletion and counter-irritation, narcotics, hypnotics, and sedatives, and as complete mental and bodily rest as it is possible to give the patient.

Opium and its salts cannot be done without in the treatment of brain tumors; in some instances it would be positive cruelty to deprive the patient of this resource; nevertheless, the conservative physician will not be too hasty in his resort to this drug. He must carefully

consider the endurance of his patient and the probable duration of his disease, but a patient can often be rendered comfortable with a comparatively small quantity of the drug judiciously administered. If rashly used enormous doses will soon be required. Hypodermic medication, as would be expected, is the most efficient method, and not infrequently the soothing syringe soon gets into the hands of the patient himself. Care therefore should be taken.

Cannabis indica alone or combined with other drugs, particularly with the bromides and chloral, will often prove very serviceable for the relief of the suffering of a case of brain tumor. In serious advanced cases, where a relief of the otherwise constant agony is imperatively demanded, a good routine method is to give the patient three or four times a day a full dose of a mixture of cannabis indica, chloral, and bromides, and once or twice in the twenty-four hours a hypodermic injection of morphine.

The bromides alone have but little influence in relieving the suffering of brain tumor, although they may be of great value as adjuvants, assisting to prevent the convulsions by relieving cortical irritability, and perhaps in other ways.

Antipyrine and antifebrin, in doses of from 10 to 20 grains, may sometimes be given with advantage in tumor cases, but, like the bromides, they are chiefly valuable with other remedies, like opium and Indian hemp.

SPINAL TUMORS.

THE treatment of spinal tumors presents a worse outlook than that of intracranial growths. Antisyphilitic measures and operation are our only curative resources, but the latter, formerly dismissed as chimerical, absurd, or even cruel, now has an advocacy based upon at least a few striking successes. Nothing need be said about the treatment of syphilitic tumors of the cord and its envelopes different from what has been already stated in discussing the therapeutics of intracranial growths. The same rules and methods of treatment are applicable for all forms of nervous syphilis. If any difference should be made, it ought to be in favor of the most prompt and active treatment in the spinal disorder, as, owing to the small calibre of the spinal canal, a growth might destroy the cord by compression before a lagging therapeutist had pushed his syphilitic remedies sufficiently to prevent the progress of the lesion. Mercurial inunction, hypodermic injections of mercury, rapidly augmenting doses of the protiodide, biniodide or bichloride of mercury, or of the iodides of sodium or potassium, or of other preparations of mercury or of iodine, should

be vigorously administered, paying the same attention to details as have been insisted upon in the last section.

If the tumor is diagnosticated as tubercular, the treatment must be the same as that advised in tubercular meningitis and tubercular growths within the cranium—namely, mercury, iodides, hydriodic acid, iodoform, iron, malt, cod-liver oil, arsenic, good food, fresh air, rest, opiates, etc.

The removal of tumors of the spinal bones and membranes has been successfully accomplished, and, strange to say, although not for reasons intrinsic to the respective merits and dangers of intracranial and intraspinal operations, more successful results have been achieved in the latter than in the former. Macewen, Gowers, Abbé, and Horsley have all reported successful cases. White and Dercum have reported a case which was seen by me in consultation, in which, although no tumor was found, the removal of peridural connective tissue which had undergone some thickening and the separation of subdural adhesions were followed by very marked improvement in sensation and mobility, which improvement went on to entire recovery. Laquer has reported a case operated upon by Rehan in which a small extradural lymphangioma was found compressing the cauda equina, and was easily removed. Two weeks after all pain had disappeared, and four months after recovery was almost complete, although such serious symptoms had been present as loss of sensation, abolition of the knee-jerks, and continuous and severe sacral pains. White[1] refers to these and to other non-successful cases in an interesting monograph on the surgery of the spine. I have also discussed this subject in a paper on spinal localization.[2]

In spinal tumors, as in other forms of irritative and destructive spinal disease, we may have to deal with particular symptoms of great importance. Cystitis may be present, and if not properly managed may constitute a source of discomfort and danger almost equal to that of the tumor itself. The catheter should be used if necessary, the bladder should be washed out from time to time, the patient should be carefully protected from dribbling, which may lead to excoriation or even abscesses, and remedies to improve the condition of the urine and to annul pain and inflammation should be employed. Hot poultices or counter-irritation will often be found of value. Bed-sores may occur, and one form of trophic eschar is especially frequent, that known as the sacro-ischiatic bed-sore or ulcer. The treatment for the relief of pain and suffering is practically the same as for brain tumors.

[1] *Therapeutic Gazette*, Oct. 15, 1891.
[2] *Ibid.*, May 15 and June 15, 1889.

MENINGITIS.

THE treatment of the different forms of encephalic and of spinal meningitis is largely the same. It is unnecessary to separate the discussion of cerebral, cerebellar, and basal meningitis, as the general rules of treatment are the same for all irrespective of location, although prognosis may be much influenced by the position of the disease; but it is far different when we come to consider the treatment of meningitis according to its etiological varieties. A meningitis due to syphilis, tuberculosis, or septicæmia might, for example, require to be handled somewhat differently from one the result of alcohol, rheumatism, or sunstroke.

Meningitis, whether cerebral or spinal, is subdivided, in the first place, into inflammation of the dura mater, or pachymeningitis, and inflammation of the pia-arachnoid or soft membranes, which is often spoken of as leptomeningitis. When the term "meningitis" alone is used inflammation of the pia-arachnoid membrane is commonly meant, but it is better for the clinician and therapeutist always to distinguish between pachymeningitis and leptomeningitis. In the discussion of the forms of meningitis some of the older writers attempted to separate inflammation of the pia mater and arachnoid, and an arachnitis has been described by some writers, but on no certain grounds. Least of all can any reasons be given from a therapeutic standpoint for making this separation. The pia-arachnoid is one membrane for all practical purposes. Both pachymeningitis and leptomeningitis may be either acute or chronic. Inflammation of the dura mater presents two readily separated varieties, external and internal pachymeningitis, according as the outer or inner surface of the membrane is mainly affected; and to this fact some attention must be paid in the discussion of the treatment.

Meningitis either of the dural, or more commonly of the pia-arachnoid, form may be extensively subdivided according to its etiology. The following classification by E. Long Fox[1] is a valuable practical arrangement, particularly for therapeutic discussion, although perhaps capable of some improvement. He divides the cases of meningitis into tuberculous and non-tuberculous, the non-tuberculous including many forms, for the most part as follows: "1. Epidemic cerebro-spinal meningitis; 2. Syphilitic; 3. Traumatic; 4. A form due to a peculiar variety of sunstroke; 5. That brought on by overwork of the brain; 6. A purely idiopathic form, that may or may not be associated with rheumatism and, more rarely, a gouty diathesis; 7. The meningitis that sometimes accompanies a lethal form of delirium tremens; 8. That which is the sequence of purulent disease of the middle ear or of the nasal bones; 9. A form associated with diseased

[1] *Am. Journ. Med. Sci.*, vol. xcix., June, 1890.

kidneys; 10. One seen in connection with diseased cerebral arteries, and probably dependent, like sclerosis, on imperfect circulation; 11. Meningitis the direct result of the progress of intracerebral or intracranial tumors or cerebral abscess; 12. A form probably due to metastasis, as in erysipelas, but as cerebral meningitis is sometimes found in various forms of blood-poisoning, it is quite likely that in erysipelas it is due rather to the presence of micrococci than to metastasis, the more especially as cerebral meningitis is sometimes a sequence of typhoid, etc."

The paper from which this classification is quoted—one of the few devoted to the treatment of meningitis in journals of recent years, although the literature of the subject is extensive in other directions—contains a number of valuable suggestions, of which I have availed myself in the preparation of this article.

As the treatment of epidemic cerebro-spinal meningitis is considered elsewhere in this SYSTEM, it will not be discussed here. Such etiological varieties of meningitis as those due to rheumatism, gout, erysipelas, etc. would, perhaps, best be considered under the general head of infectious meningitis, although the treatment may differ somewhat according to the special diathesis or primary disease. Meningitis connected with intracranial tumors and cerebral abscesses does not differ essentially from that which is the sequence of purulent disease of the middle ear or of the nasal bones. While the arrangement of Fox is, therefore, useful, as showing many of the ways in which meningitis may originate and the necessity of differences in treatment according to etiology, it need not be closely followed in discussing the therapeutics of the disease. I will, however, have something to say about the treatment of most of the separate forms which he includes in the foregoing classification. Let me first say a few words about the varieties of pachymeningitis and their treatment, although much that is said of meningitis in general and of any form of this affection will answer both for pachymeningitis and leptomeningitis.

External pachymeningitis is rarely if ever a primary disease, and a consideration of its treatment must be largely one also of the affections with which it is associated or to which it is secondary. Frequently it is due to traumatism, and therefore exists with fractures, hæmorrhages, and other results of injury, and little or no headway can be made with the treatment of the inflammation of the membrane until all persisting irritations are cleared away—until, for instance, the depressed bone is elevated, the penetrating spicula withdrawn, or the hæmorrhage if possible removed or absorbed. The symptoms in such a case may be largely or even mainly dependent upon the diffused and diffusing irritation, the cause of which is limited to a small spot or area, but the latter must be attended to first, or at least at the same time with the

former. Another common cause of external pachymeningitis is the spread of inflammation from bone disease, particularly that form of bone disease so often associated with the apparatus of hearing. In a case of this description the ear and bone disease must of course receive full attention while trying to alleviate the accompanying inflammation of the dura mater. Doubtless in a few cases external pachymeningitis originates from sunstroke or heatstroke, and some of the varieties of meningitis referred to by Fox may be, in part at least, affections of the external dura mater, as the syphilitic and infectious forms and those associated with intracranial tumor.

The symptoms of external pachymeningitis are not uniform, but, whether the disease is from injury, from extension of inflammation to neighboring parts, from sunstroke or syphilis, present some similarity in symptomatology. The most common symptoms are headache, which may increase in intensity with the progress of the disorder, vertigo and vomiting, with sometimes, particularly when the inflammation is extensive or spreads inwardly, paresis and convulsions. Of course when suppuration takes place septic symptoms and those of compression may develop, the patient suffering with fever and delirium, and if not relieved perhaps dying in coma. Forms of pachymeningitis both internal and external sometimes occur in the aged and broken-down. The symptoms in such cases are usually not of a definite character, but dull headache is one of the most common, and this is usually associated with some mental obtuseness and deterioration, which, however, is more likely due to the senile brain-degeneration than to the disease of the dura mater. When external pachymeningitis is due to syphilis or any infectious disease its treatment should be that which is applicable to syphilitic or infectious disease of any form. For the pachymeningitis of old age nothing of course can be done but to support the failing strength of the patient and carefully regulate the functions of the various organs.

Internal pachymeningitis may be of several varieties: we may have a purulent form of this disorder, as of the external layers of the dura, and, like the latter, this is almost invariably secondary to disease or injury of other tissues, as after traumatisms of the skull or disease of the petrous portion of the temporal bone. A well-known and much-discussed form of pachymeningitis is that known as internal hæmorrhagic pachymeningitis or hæmatoma of the dura mater. Its origin has been much disputed, but this question cannot be gone into here. It is frequently a disease of old age; it is often found to be present in autopsies upon the insane, although its existence may not have been recognized during life; it is a comparatively frequent condition in paretic dementia, but may be found in cases of chronic alcoholism, scurvy, and generally in the wretched shipwrecks of humanity who are

to be found in great charity hospitals, and are usually the victims of a complication of organic affections, such as phthisis, syphilis, and alcoholism. Its symptoms are not very distinctive, but the cases can sometimes be recognized by a careful diagnostician. They are mainly those which have been mentioned as occurring in external pachymeningitis. Sometimes paralysis or spasm on one side of the body appears also on the other, showing that a new hæmorrhage or inflammation has occurred on the side of the brain at first not affected. Drowsiness, contracted and irresponsive pupils early, and later dilated pupils, and irregular pulse are among the symptoms of the disorder in addition to those already mentioned. In the treatment of this affection all that can be advised is attention to the habits of the patient and to diseases of the kidneys, heart, lungs, etc., occasionally leeching or dry cupping, derivatives and counter-irritants, and during acute attacks saline laxatives, mercury, and sometimes opiates with bromides.

Leaving inflammations of the dura mater, a somewhat barren field, I will pass to the consideration of the treatment of the different varieties of pia-arachnoid inflammation, in the first place, making a few suggestions, which are applicable to any and all forms of meningitis.

As meningitis, multiple neuritis, and probably even myelitis and encephalitis, are often of infectious origin, an important practical matter with reference to the treatment of these inflammations is that of dealing with them actively at an early stage, and if possible from the bacteriologico-therapeutic point of view. I have seen in the chronic stages a few terrible cases of meningitis and multiple neuritis, with or without associated cord and brain inflammations, which were set up during the progress or even at an early stage of such well-known infectious disease as scarlet fever, diphtheria, and grippe. In these cases and in cerebro-spinal fever, while proper attention is paid to the relief of pyrexia and pain by the administration of antipyretics, anodynes, and narcotics, too little sometimes is given to the use of agents which are calculated to combat the organisms in the blood and to change the soil in which they flourish. The administration of large doses of such remedies as bicarbonate of potassium, salicylate of sodium, gaultheria, etc. might be successful in preventing the development or limiting the progress and destructive after-effects of an otherwise severe meningitis or multiple neuritis.

It is the duty of the physician to relieve the suffering of the patient in any form of meningitis. This can be done, in the first place, by absolutely ridding the patient of all external sources of irritation. To direct that the patient shall be kept quiet and free from annoyances should not be a mere routine matter; but noises, bright lights, unnecessary visits and talking, should be strictly prohibited. Both bed and room should be as comfortable as possible. Opium and its prep-

arations are indispensable in most cases: the physician is finally thrown back upon these, and is wanting in his duty to his patient if he does not resort to them when needed, although I would by no means advocate their early or frequent use.

Opium preparations are probably of value in some cases of meningitis, particularly the basilar and spinal varieties, for their stimulant and tonic influence on the nerve-centres. In the epidemic and other forms of meningitis glycosuria is often present, pointing to irritation of the floor of the ventricle. Fox suggests that morphine and other salts of opium may exercise a tonic influence on the centres of the medulla oblongata, as they seem to do in many cases of diabetes. Among the best preparations of opium in meningitis are the deodorized tincture, the salts of morphine, and codeine. It is often best to give these drugs in combination with the bromides or cannabis indica, chloral, or sulphonal. Aconite can sometimes be used advantageously in various combinations, and paraldehyde is particularly useful in alcoholic, traumatic, or other cases with considerable excitement. Drugs of this kind should be used in full doses, although it is sometimes necessary to feel the way, particularly when patients are depressed and weakened and when the disease threatens such important centres as the nucleus of the vagus or of the phrenic. It is remarkable how well and for how long a time some meningitic patients will bear narcotics and sedatives, and particularly opiates.

In all forms of meningitis the reduction of temperature must not be neglected. Occasionally an heroic dose of an antipyretic is necessary to prevent the progress of the disease to death. The mistake, however, must not be made—one of somewhat frequent occurrence in these latter days when antipyretics are the most fashionable drugs in acute affections—of resorting to antipyretics indiscriminately, or of using them too continuously, or as the sole treatment in a case which at the same time demands alteratives and absorbents as well as tonics, stimulants, and nutrients. The remedies of most importance are antipyrine, antifebrin, phenacetin, and aconite. Quinine, combined with moderate or large doses of hydrobromic acid, has sometimes proved useful. While wet packs and cold general baths are not advisable, owing to the weakened condition of the patient and the complications of the disease, sponging with cold or with tepid water is often of great value in reducing temperature and quieting the irritability and restlessness of the patient.

According to Huguenin, cold water and a lukewarm bath are the vigorous means of temporarily rescuing patients from coma even in tubercular meningitis. In non-tubercular forms of meningitis, especially in children, he describes himself as an enthusiastic votary of this treatment. They are especially useful in bringing the patient out

of states of coma, for which purposes cold compresses can also be used. Ice-bags to the head and cold affusions are old remedies that need judgment in their use.

I will now pass to the special consideration of some of the etiological varieties of meningitis.

The treatment of tuberculous meningitis is not a promising field, and yet this affection demands treatment for the palliation of symptoms which cause suffering, and even with the view that it may be possible to arrest the progress of the disorder. Its prevention in many cases is possible, and therefore prophylaxis rises to the highest importance. In families with a history of tuberculosis the possibility of its occurrence should be borne in mind, and tuberculous mothers should not nurse their children, and such children should be kept in the open air as much as possible. Where families are in the habit of leaving town they should go to the seashore or the mountains as early as possible in the season. For the children of the poor much can be and is done for the prevention of all tuberculous diseases and of disease in general by the various humane enterprises which under the name of the "fresh-air fund," etc. take children to the country, to the seashore, or to the mountains for brief periods during the hot months. Such changes do more to prevent the development of constitutional diseases in weakly or badly-environed children than the most liberal use of medicines or nutrients. It is not necessary, however, to dwell at length upon matters of this kind, which are treated of fully under other heads, and I would refer the reader therefore to the exhaustive paper on Tuberculosis by Dr. S. Solis Cohen in Volume I. of this SYSTEM.

The possibility of curing tubercular meningitis when not too far advanced has been advocated. Cures have been claimed, by Hahn, for example, of seven cases, but, according to Minot,[1] in five of these evidence is entirely wanting that they were tubercular meningitis. Cadet de Gassicourt concludes that most of the alleged cures are cases of limited extent arising from the presence of tubercular tumors, syphilitic gummata, cerebral sclerosis, and neoplasms of various kinds. Fox says: "Many practitioners have seen cases supposed to be of tuberculous meningitis recover, and the not rare instances of chronic meningitis with distended ventricles, with the views of some neurologists that certain cases of insanity have been caused by a meningitis partially recovered from, show that when the amount of the tubercle is small and there are no physical signs of general tuberculosis partial recovery from the original disease is not impossible."[2]

The fact that tubercular meningitis cannot always be distinguished

[1] Pepper's *Syst. of Med.*, vol. v. p. 735.

[2] Fox, *Am. Journ. Med. Sci.*, vol. xcix., June, 1890.

from leptomeningitis of a more curable type is an argument in favor of active treatment at least for doubtful cases. On general principles it would seem that tubercular processes within the cranium, as similar disease elsewhere, might sometimes be arrested. Hasse was a believer in the curability of miliary tubercular meningitis of the pia mater, but Huguenin states that he has never found in the pia mater anything resembling a harmless encapsulated deposit, or indeed instances of absorbed miliary tubercle. He does not therefore consider a recovery as proved, but regards it as undecided whether a very limited number of miliary tubercles might remain without doing any harm, and might be subsequently removed by some retrograde process.[2]

Among remedies recommended by various authorities as having some special value in tubercular meningitis are mercury, the iodide of potassium and of sodium, and iodoform. Certainly a trial should be given to one or more of these drugs in a dose proportioned to the age of the patient. In children the doses of the iodide should vary between 1 and 5 grains three or four times daily, while for adults the doses may range as high as from 10 to 15 grains. Preferably, however, they should be the smaller amount; it is a mistake to push iodide in tubercular meningitis as would be done in syphilitic cases. An excellent combination possibly to act upon the disease itself, and at the same time to relieve restlessness, irritability, sleeplessness, and pain, is that of iodide of sodium with bromide of sodium, and either cannabis indica or hyoscyamus, preferably in the form of tincture, and in doses ranging from 5 drops to ½ drachm, according to age and indications. Syrup of hydriodic acid is a remedy well worthy of trial on the same principles that the iodide would be used.

Mercury seems to have gone somewhat out of repute, although at one time the chief resort in tubercular as in other forms of meningitis. If used at all, it should be in small dose frequently repeated, and preferably in the form of calomel or corrosive sublimate. An advantage seems to accrue from a combination of mercurial preparations with other cathartics for the relief of the constipation which so often accompanies these cases. Even if mercury is regarded as practically useless in tubercular meningitis, as the diagnosis between it and non-tubercular meningitis is often doubtful, and as it is certainly useful in the latter affection, it should in some cases at least be given a trial.

Of external applications for tubercular meningitis, mercurial ointment and iodine ointment were formerly much in vogue, but of late years have as a rule been abandoned. Fox says that inunction with iodoform ointment is sometimes useful.

The use of antipyretics in tubercular meningitis has been a subject

[1] *Ziemssen's Cycl. Pract. Med.*, Am. ed., vol. xii. p. 574. Hasse is cited by Huguenin.

of some dispute. Huguenin advises them only in cases where the diagnosis is doubtful, as between meningitis or typhoid fever or septicæmia, holding that in such doubtful cases the treatment to be followed would be the use of cold bath, quinine, salicylic acid, and salicylate of sodium. A reason for using antipyretics given by Fox is worthy of attention, and that is that the pyrexia, however induced, is favorable to the increase of the tuberculous as of many other bacilli, possibly by paralyzing the inhibitory heat-centres by the absorption of the poisonous chemical products of their growth. Under such conditions reduction of temperature should be attempted, preferably with antipyrine, which may be given with digitalis to counteract the depressing effects on the cardiac nerves caused by the presence of the inflammation in the pons-oblongata region. Phenacetin may prove useful for this indication as well as to relieve pain.

In these days of great surgical advance the operative treatment even of tubercular meningitis cannot be passed by as unworthy of consideration. In rare cases tubercular deposits may be so isolated as to form growths which are capable of removal.

Lanphear[1] has advocated an operation in tubercular meningitis which, so far as I know, has never yet been tried—namely, opening the skull and washing out the meningeal spaces as we do the belly in tubercular meningitis. He reasons that the peculiar disappearance of the tubercular process in peritonitis, treated by flushing the abdomen, leads to the conclusion that a similar result might be anticipated in tubercular meningitis when complicated with hydrocephalus. Professors Senn of Chicago and Keen of Philadelphia, who were written to by Lanphear, believe the operation justifiable. The former advocates tapping with a small trocar under strictest antiseptic precautions, and injecting 2 drachms of a 10 per cent. iodoform-glycerin emulsion —practically the same treatment which has proved so successful in tuberculosis of the joints. Keen prefers opening the skull, tapping the ventricles, irrigation, and drainage.

In hydrocephalus associated with tuberculous meningitis Cheyne and Southerland have recommended a special method of intracranial drainage, which consists in trephining the skull, opening the dura, and introducing a catgut drain through the cortex into the lateral ventricle. After the drainage is established the dura is sutured over the brain, and the scalp is also sutured. Lumbar puncture may also be resorted to as a palliative measure.

Meningitis due to syphilis may be either of the convexity or of the base: perhaps more commonly than other forms it is likely to attack limited and scattered areas of the brain-membranes; often the different membranes may be attacked at the same time in different places, and

[1] *Am Jour. Surg. and Gyn.*, vol. ii., Jan., 1892, No. 6, p. 143.

not uncommonly bone disease is associated. The remedies which will prove most useful in such cases are, internally, calomel, the bichloride or the biniodide of mercury, and, in large doses, the iodide of sodium, the iodide of potassium, or hydriodic acid. Affections of the cranial nerves—oculo-motor paralysis or paralysis of the fourth, fifth, sixth, or seventh nerves, and more rarely of the eighth—are seen in such cases almost as frequently as in tubercular meningitis. The appropriate treatment should be used early and energetically, the preference being first given to mercury; and here, as in tumors of the brain or its membranes, mercurial inunctions or corrosive-sublimate injections will often be found of the greatest service. Such treatment, pushed at an early period, may prevent the local softenings which so often result from the thrombosis which accompanies syphilitic meningitis and arteritis.

The form of meningitis which occasionally occurs from sunstroke or heatstroke does not call for any particular line of medication, except perhaps that in such cases, if the disorder is acute or subacute, leeching, cold effusion, or counter-irritation to the vertex, and, as the patients are often depressed and exhausted, caffeine, digitalis, and ammonia combined with the bromides and other sedatives, may prove of particular value.

Meningitis of traumatic origin, in the first place, calls for surgical decision. If any clear indications for operation exist, as an evident depressed fracture, trephining should be at once employed. Localized pachymeningitis frequently results from severe injuries, even in the absence of fractures. Extravasations small or large are caused by the concussion, and may act as a focus from which inflammation spreads. The most common train of symptoms in such cases is a combination of localized pain with dizziness, sometimes nausea, and states of nervous irritability and apprehension. Such cases, however long they may have endured, should not be passed thoughtlessly by. Careful examination of the shaven scalp should always be made for cicatrices and depressions, and even exploratory operations should be performed if in doubt as to the conditions. If operation is decided against, an active, aggressive treatment should be given a fair trial. This, in the first place, should consist of counter-irritation with croton oil, tartar emetic, or other irritating ointments, preceded or accompanied by localized bloodletting, preferably with leeches, as near as possible to the seat of injury or to the place where the counter-irritative treatment is applied. For alterative and absorbent treatment I prefer in these cases to give large doses of iodide of sodium, as from 20 to 60 grains, combined usually with bromide of sodium in an equal or less quantity. If the case does not improve promptly under iodide treatment, mercury should be added in the form of inunction or of the internal administration of bichloride or biniodide.

In traumatic cases, no less than in others, rest and quiet should be strictly enforced; and abstinence from alcohol, and even from tobacco, is often of the greatest importance. Paraldehyde in doses as large as from 1 to 2 drachms is sometimes of great value in traumatic as in other forms of meningitis; the dose given of this drug is sometimes too small to be of any practical benefit, although, on the other hand, it is true that we may not always be able to use it in as large doses in meningitis as in delirium tremens and in some of the forms of acute mania.

Fox refers to one form of meningitis brought on by overwork of the brain, and occurring in children from cramming and competition in schools. The evil effects of forced and unwholesome school-work are many and serious, and have been the object of some personal investigation on my part. Meningitis, however, is certainly rarely due wholly to such a cause: even the severest intellectual labor associated with irregular habits in adults rarely results in meningitis in the absence of other causes, as constitutional disease, infection, injury, alcoholism, or inherited tendency. Cerebral hyperæmia is doubtless produced in this way, and yet even this is of comparatively rare occurrence. It is important for therapeutic reasons to have clear ideas upon this subject, as it is a somewhat popular and prevalent notion that meningitis often results from mental overstrain both in the young and in the mature, and hence treatment is misdirected. The affections and conditions which originate in this way may be almost or quite as serious as a pure meningitis, but they are rather forms of neurasthenia, melancholia, chorea, hysteria, hystero-epilepsy, and other functional mental and nervous diseases. Cases with clear symptoms of meningitis have, however, been reported as occurring in young children who were overworked and overworried with school duties and the accompanying emotional excitement, or in adults engaged in some trying intellectual labor carried on day and night under difficulties and embarrassments. The best explanation of most of these cases is that latent or predisposed constitutional disease, such as tubercular, alcoholic, syphilitic, rheumatic, or gouty meningitis, has been lighted up by flushing the brain and weakening the general system. Treatment in such cases should therefore be twofold, or perhaps threefold. A constitutional affection should be sought for, and remedies to combat it employed, while at the same time resort is had to measures to reduce inflammation and to strengthen the debilitated patient. Complete rest of mind and body, which of course includes the removal of all sources of strain and excitement, should be required. Iodides, mercury, hydriodic acid, alkalies, the salicylic preparations, and other remedies designed to change the toxæmic state of the blood, and drugs like the bromides, hydrobromic acid, aconite, veratrum, conium, hyos-

cine, and the coal-oil derivatives, may be indicated. In short, we know of no special or specific treatment for a meningitis coming on and apparently due to overwork of the brain. Prophylaxis is here the best of all remedies.

I do not like the term "idiopathic," no matter to what disease it is applied, and it seems to me particularly lacking in accuracy when used to describe a meningitis. A meningitis of unknown cause which might be regarded as idiopathic should simply be treated upon the same principles as those cases to which we have referred as occurring apparently from overwork. If rheumatism, gout, erysipelas, influenza, diphtheria, scarlet fever, small-pox, arsenic, lead, or any infectious disease or toxic agent can be reasonably regarded as the source of a meningeal inflammation, the treatment should be pushed with remedies for these constitutional conditions at the earliest possible stage of the affection in accordance with the principles which we have already indicated when speaking of the various inflammatory disorders which are of infectious and toxic origin.

That a chronic form of inflammation of the cerebral membranes occurs in connection with diseased kidneys and diseased blood-vessels admits of but little doubt. The numerous autopsies held at large charitable institutions—like the Philadelphia Hospital, for instance—often reveal opaque and thickened membranes, particularly a low form of what might be called pia-arachnitis; but for such a disease we have no special or specific treatment. Therapeutics should be directed to the relief and improvement of the conditions which are brought about by the diseased kidneys, degenerated heart, and rigid vessels. Doubtless in such cases hyperæmic exacerbations are of frequent occurrence, and can be profitably attacked with bromides, antipyrine, and similar remedies, but such treatment will be only of partial avail, or possibly harmful, if heart and kidneys are not duly attended to and the strength of the patient sustained. Much good is accomplished in such exacerbations by careful attention to the liver and gastro-intestinal tracts for reasons which need no discussion.

CEREBRITIS.

The synonyms of cerebritis are encephalitis and inflammation of the brain. The nature and frequency of inflammation of the brain are subjects which have been much disputed by clinicians and pathologists, and particularly the latter. Formerly almost all forms of brain softening were ascribed to inflammation; of late the tendency rather seems to be to exclude inflammation altogether as a cause of softening. Both of

these extreme positions are wrong, although it is true that softening of the brain is much more frequently due to occlusion of vessels than to any other cause. Durand-Fardel was one of the most persistent advocates of the inflammatory theory, and Hughlings Jackson was among the earliest clearly to combat the doctrine, holding that this pathological condition was local and due to closure of vessels, and usually to embolism and thrombosis. Besides embolism or thrombosis, however, blood-vessels may be closed by other processes, as the encroachment of a tumor or an exostosis.

Idiopathic cerebritis has been described, but, like many "idiopathic" diseases, it probably exists only in name. A generalized idiopathic cerebritis may be dismissed. General inflammation of the brain, like general softening, has never been seen, and is a practical impossibility; but widely, almost generally diffused, centres or foci of inflammation and similar areas or lacunæ of softening are of not infrequent occurrence. It is the difference between widely distributed local processes and a continuous process throughout an extensive region. After either inflammation or softening from vascular occlusion has exceeded certain limits death must result. A diffuse form of surface cerebritis is sometimes met with, but it can by no means be ranked as general inflammation of the brain-substance. It is a pericerebritis or periencephalitis, affecting only the cortical gray matter, and perhaps only the superficial layers of the cortex. From the very nature of the intimate connection between the pia-arachnoid membrane and the brain itself this periencephalitis must be nearly if not quite always associated with a meningitis, so that the affection will be rather a meningo-encephalitis or meningo-cerebritis than a pure cerebritis; but as its treatment is practically the same as that of cerebritis, its occurrence should be borne in mind. The coexistence of cerebritis with meningitis of course renders the prognosis more serious and the treatment less hopeful, but the indications for treatment are for this reason more urgent. In general paralysis of the insane a chronic periencephalitis or meningo-encephalitis which leads to brain destruction and atrophy may be an important part of the disease.

In 1884, Strumpell made a suggestion which has attracted some support, but more opposition: this was that certain forms of infantile cerebral hemiplegia were due to an acute and more or less localized cortical polioencephalitis, similar in character to the anterior poliomyelitis which causes spinal infantile paralysis, and the various forms of nuclear encephalitis, which result in bulbar paralysis or ophthalmoplegia. The cases with autopsies which support the conclusion are so far very few. Sachs and Peterson,[1] who are not emphatic in their endorsement of Strumpell's position, nevertheless give some

[1] *Journ. Nerv. and Ment. Dis.*, May, 1890, vol. xv. p. 320.

interesting facts bearing upon the question. They refer to the history given by Mobius of two children in one family, aged one and a half and three years respectively, who were stricken down with fever, loss of appetite, and somnolence—one developed a typical poliomyelitis of the upper extremity, the other spasmodic hemiplegia without aphasia. They refer also to Strumpell's two cases of adult apoplexy, in which every one would have made the diagnosis—and indeed he made it—of embolic softening, but the post-mortem examination revealed a condition of hæmorrhagic encephalitis of the gray as well as the white matter. Marie believes that the encephalitis may attack the white as well as the gray matter; and both Jendrassik and Marie favor the perivascular (inflammatory) origin of the lobar sclerosis, which they have carefully described. Sachs and Peterson venture the opinion that polioencephalitis corticalis may be the cause of some of the cases of infantile palsies, both hemiplegic and diplegic, and refer to cases of their own.

The disease, as described by Strumpell, usually comes on acutely in very young children, vomiting, convulsions, and fever being the prominent symptoms. Sometimes complete recovery takes place in a week or two; sometimes paralysis, usually monoplegic or hemiplegic, but sometimes of irregular type, is left behind. Contractures, atrophies, monochoreas or hemichoreas, hemiathetosis, chronic convulsions, often of the unilateral type, and a greater or less grade of imbecility, are the most common persistent states. This disease should at least be looked for and its treatment anticipated. Like anterior poliomyelitis, its occurrence is usually overlooked until its sequelæ have attracted attention.

Besides the acute cortical polioencephalitis of Strumpell, other special forms of brain inflammation have been described, as, for example, inflammatory hypertrophy of the brain cortex, with a symptomatology which includes epileptiform convulsions and some arrest of mental development. Such a case has been studied by Danillo and is referred to by Spitzka,[1] who speaks also of a form of miliary encephalitis in a new-born child due to septic causes, such as suppuration of the umbilical cord.

Commonly cerebritis is an associated affection; it frequently accompanies a meningitis either localized or diffused; brain tumors usually give rise to both meningitis and cerebritis in their vicinity; at a certain stage of hæmorrhagic apoplexy inflammation of the surrounding tissues occurs, and it may also arise in connection with either thrombosis or embolism, the plugged vessels acting as foci of irritation; injuries of the brain, even when they are not accompanied by fracture, and frequently when they are, sometimes have cerebritis as one of their results,

[1] *American Syst. Pract. Med.*, vol. v., 1886, p. 792.

and cerebritis often accompanies bone disease, either simple osteitis or caries. An area of inflammation, which has been called the encephalitic zone, may, in short, be set up around anything which having been introduced into a special local area of the brain acts there as an irritant. It may therefore surround a foreign body, depressed bone, a tumor, an embolus, or an infarct. Such facts must be borne in mind even in the discussion of the treatment of cerebritis. The treatment of the meningitis and cerebritis which accompany hæmorrhages, tumors, bone diseases, etc. is often the most important matter in the management of the case, as these affections may be the source not only of much of the pain which the patient suffers, but of many if not of most of the other symptoms.

In various ways cerebritis may give rise to that most serious and commonly incurable affection, abscess of the brain, and it is important, if possible, by either prophylaxis or by treatment, to prevent this undesirable consummation. When the inflammation is of a violent character, the lymphoid cells may become so numerous and so active as to set up suppuration; and Gowers states that such a purulent condition has been acquired in as short a time as six or seven days, but usually it takes much longer than this for a severe inflammation to result in abscess. When an abscess results directly from inflammation, the early stage of the process presents the condition which is often described under the name of "red softening." Hæmorrhagic foci, collections of leucocytes, effused liquids, and disintegrated tissue-elements are found in cases of red softening; and, carried a little farther, the inflammation passes into a purulent stage.

Abscess is sometimes caused by emboli of a septic or specific character. Certain infectious agencies may excite inflammation and eventually lead to the formation of abscess. Various acute diseases of infectious or contagious character, as diphtheria, scarlet fever, variola, influenza, typhoid or typhus fever, and erysipelas, may set up a disseminated cerebritis of peculiar character. Little foci of inflammation are scattered here and there throughout the brain. This form of disseminated cerebritis may also be present in septicæmia. What has been termed mycosis of the brain is a form of this disseminated inflammation—an affection in which little colonies of micrococci are found scattered throughout the brain.

The possibility of the occurrence of disseminated or other forms of encephalitis should be borne in mind in the treatment of serious cases of infectious disease. The treatment of such diseases in certain stages may become, in fact, the prophylactic treatment of cerebritis or of meningitis, or of both; and a fuller recognition of this truth will result in an improvement in therapeutics which will give fewer grave sequelæ of these infectious diseases. In diphtheria, scarlet fever,

typhoid fever, erysipelas, and similar affections, when symptoms of active, multiple inflammation present themselves, resort should at once be had to that treatment which will most successfully avert these threatened inflammations, while at the same time the patient's general health is carefully sustained.

It is difficult to give a clear symptom picture of cerebritis, for reasons which are evident in the discussion of its varieties. The order and train of these symptoms must differ according to the extent and seat and character of the inflammation. Some symptoms are likely to be present in all varieties, and among these headache of a deep-seated character is the most common. Delirium and convulsions are also frequent, but not nearly as common an occurrence as boring or deep-seated headache. If the case is one of pure cerebritis, which is rare, optic neuritis is not necessarily, or even likely to be, present. Of course the symptoms will vary much with the seat of inflammation—whether, for instance, it is situated in the sensory or motor brain-areas—but unless the inflammation goes on to abscess the local symptoms are frequently clouded by the general disturbances, such as headache, delirium, and convulsions. The disseminated cerebritis of which we have spoken as occurring in various infectious diseases and as the result of septic inflammation presents no regular train of symptoms.

The diagnosis of cerebritis once having been made, its treatment will not differ in any essentials from that of meningitis, with which it is so commonly associated. The treatment must, however, be modified somewhat by a consideration of the variety of the affection with which the physician is called upon to deal—whether, for instance, he has a diffused periencephalitis or meningo-encephalitis; a localized cortical polioencephalitis; a cerebritis due to septic infection, or following or accompanying an acute infectious disease; or a cerebritis caused by traumatism, sunstroke, or toxic agents, or associated with osteitis, caries, abscess, tumor, hæmorrhage, embolism, or other local disease. Certain general principles of treatment will of course obtain, no matter what may be the variety of the affection.

The importance of early recognizing the possibility of infection giving rise to cerebritis, as well as to meningitis and neuritis, cannot be too strongly emphasized. In the section on Meningitis I have tried to enforce the point, and need not insist at length upon it here. The physician should be alert in suppurative affections and in all serious cases of contagious, infectious, or toxic diseases, such as those due to alcohol, arsenic, lead, and poisonous gases, etc., for the occurrence of cerebritis, and should actively treat these affections at the right stages with blood-changing, germicide, and other appropriate remedies, like potassium bicarbonate and other alkaline salts, the salicylates, salicin, salol, mercury, and iodide preparations.

Attention to the reduction of temperature is imperative in cerebritis as in meningitis. Rise in temperature, as has been shown, is in brain hæmorrhage one of the evidences of the setting up of an inflammatory process around the clot. This is to be combated by the careful use of the same remedies recommended for meningitis—namely, by antipyrine, phenacetin, aconite, quinine, sponging, cold to the head, etc.

The special value of mercury in the forms of both cerebritis and meningitis which are due to injury has long been advocated, and by some as strongly to-day, but perhaps on different principles, as in former times. No physician can afford to omit the use of calomel or bichloride of mercury internally, or inunction with mercurial ointment, in cases of injury in which, before or in spite of surgical procedure, the tide of inflammation is rapidly rising. Such treatment should be usually pushed to the point of constitutional impression. With it the iodides may be administered, and my own preference is for the iodide of sodium in doses of 30 grains or more.

Only in rare cases of acute inflammation in a strong patient would general bloodletting be advisable, but leeches or cupping may sometimes be used, particularly when active cerebritis has arisen as a complication of tumor, fracture, mastoid disease, or anything causing extreme local irritation. The use of counter-irritation to the head or the back of the neck is also of service should a localized cerebritis be recognized.

When a case of cerebritis assumes a decidedly convulsive type, no combination is better than that of the bromides with antipyrine or antifebrin, giving as a rule about one-third as much of the latter as of the former drug, as 30 grains of bromide of potassium or of mixed bromides with 10 of antipyrine or antifebrin. Such a symptom as constipation must be met by the same methods of treatment as would apply to meningitis or to any other forms of brain disease.

Both to prevent cerebritis, and to keep it from passing to a purulent stage, attention to the general health of the patient is of the utmost importance. Some cases with a history of injury or of ear disease, either with or without strumous or tuberculous tendencies, may present for months or even years signs of a low form of chronic inflammation of the brain or its membranes which may eventuate in abscess. It is particularly in cases of this character that tonics, nutrients, fresh air, and good food may be efficient means of arresting or aborting inflammation of the brain.

For the localized cortical polioencephalitis of Strumpell the physician will seldom have the opportunity to try treatment, as the disease is not often recognized except by the resulting palsies, choreas, spastic states, convulsions, or mental change. In this respect the affection differs but little from that which is so much more common, anterior

poliomyelitis or spinal infantile paralysis, which is usually overlooked in the acute stage, although, owing to the addition to our knowledge of anterior poliomyelitis, physicians are much more than formerly on the lookout for its occurrence, and cases are now occasionally recognized in their acute stages, and treatment sometimes applied with resulting benefit. In like manner, when children are abruptly attacked with apparently causeless fever, convulsions, vomiting, etc., polioencephalitis should be thought of, and the patient put upon appropriate treatment, which, as the disease is probably infectious, should consist of remedies like mercury, potassium bicarbonate, salicylate of sodium, etc., already referred to so often. In these cases of cerebritis, as well as in poliomyelitis of infectious origin, a practical diagnostic point is the fact that, no matter what the form of organic nervous disease due to infectious or toxic agencies, some neuritis is likely to be an accompaniment. Such patients often have hyperæsthetic limbs or tender areas in various parts of the body, even when the predominating affection is of the brain or spinal cord.

As cerebritis so frequently results in abscess, but as also this result is not absolutely necessary, it is important to do everything possible to prevent this result. In cases of fracture prompt and appropriate surgical interference should be rendered. After an injury without visible fracture and with or without contusion or bruising, such symptoms as pain, vertigo, vomiting, and fever point to both meningitis and cerebritis. Cerebritis, and eventually abscess, is of course most frequently a complication of disease of the ear. This should always be remembered, for even the lapse of many years does not bar out its occurrence. Where the symptoms are such as to indicate localized cerebral inflammation the condition of the mastoid cells and of the middle and the inner ear should be the subject of careful investigation. Inflammation of the brain and abscess do not always result from a spread of the disease by contiguity, although this is often the case: they sometimes arise by septic infection through the veins or by the way of the perivascular lymphatic canals. Treatment should be directed in the one case to the direct surgical relief of the mastoid and the middle and internal ear, and in the other either to the destruction of the infecting microbes or to the changing of the blood in which they are multiplying.

While the treatment of cerebral abscess does not come properly within the scope of a paper on cerebritis, a few words may be said about it, as the prompt relief of an abscess of this form may be not only directly beneficial to the patient by freeing the organ of pus, but also by stopping the further spread of the accompanying inflammation. The simple rule should be that if the presence of an abscess is determined and it is accessible, it should be operated upon as speed-

ily as possible. Within a few years medical literature has been enriched by the reports of successful cases of trephining for cerebral abscess, the operations having been guided in some instances solely by cerebral localization.

NEURITIS.

Neuritis, or nerve inflammation, has recently risen to a plane of great importance. Only a few years since the disease received but scant attention, although some of the older authorities in neurology and general medicine, as Remak, Benedikt, Niemeyer, and Mitchell, recognized its frequent occurrence and numerous manifestations. It is sometimes difficult to classify the forms of neuritis for the purposes of considering its treatment. The best subdivisions for this purpose are those which have regard to its acute or chronic character, to its diffusion, and to its etiology.

All forms of neuritis may be subdivided into acute, subacute, and chronic varieties. Neuritis may also be classed as local, diffusing, and multiple. A local neuritis is one affecting any nerve or part of a nerve or group of nerves. Diffusing neuritis may be observed in any part of the body, usually in the limbs—for instance, beginning at one place, the inflammation tends to ascend the nerve. The terms "ascending neuritis" and "neuritis migrans" have sometimes been applied to this form. Finally, many nerves or almost all the nerves of the body may suffer simultaneously, giving the affection, recently much studied, known as multiple neuritis. Etiologically, the varieties of neuritis may best be divided into spontaneous—that is, without known cause—and traumatic, toxic, infectious, and epidemic or endemic, although other general classes could readily be made.

Pathologically, we may have (1) a perineuritis, the inflammation affecting solely or principally the sheath of the nerve; (2) a parenchymatous or degenerative neuritis, the nerve-fibres themselves being involved; (3) an interstitial neuritis, in which the connective tissue between the nerve-fibres is chiefly attacked; (4) a diffused neuritis, in which all parts of the nerve-bundle are more or less affected. The treatment of neuritis, however, cannot to any large extent be influenced by a consideration of its pathological varieties, except that this might suggest more promptness and vigor in the severe acute forms and more persistence in those varieties which lead to extensive and profound degeneration. Clinically, it is difficult to distinguish even between perineuritis and other forms of nerve inflammation; but we can distinguish between pain in a nerve-trunk due to central disorder,

and that dependent upon a localized affection of the nerve or of its sheath —a most important differentiation from the therapeutical standpoint.

After briefly considering the symptomatology of neuritis—which is necessary to the clear understanding of its treatment—I will first discuss the therapeutics of some of the local and diffusing forms of inflammation, and then that of multiple neuritis and one of its epidemic varieties known as beri-beri.

Acute neuritis is sometimes ushered in by constitutional symptoms, such as headache and chilliness or chills, and fever, and these may be present when the affection is local, although more likely to occur when it is diffused or multiple. When acute or subacute, pain is experienced, usually aching, burning, or boring in character, and situated in the line of a nerve-trunk or radiating through certain nerve-distributions. This pain will be felt not only wherever the inflammation exists, but it may be projected to parts somewhat remote, as a nerve irritated anywhere in its course may evoke a response in any place to which it is distributed. Subjective pain, however, is not sufficient for the diagnosis of neuritis; particularly when of acute or subacute type, sensitiveness or hyperæsthesia is always a prominent manifestation, pressure over nerve-trunks or endings sometimes causing extreme pain. Compressing a nerve between other structures may cause great agony, as, for instance, on squeezing the foot when the digital branches of the plantar nerve are inflamed. Various paræsthesias or perverted sensations, as feelings of burning, tingling, pricking, and numbness, may show themselves. The degrees both of pain and sensitiveness differ considerably in neuritis according to its location and diffusion. I have seen a few cases which might be described as dermal neuritis, in which the skin was exquisitely painful and tender throughout the entire limb, the sensory symptoms not following special nerve lines or radiations. In other cases the tenderness to pressure can only be determined by carefully searching for accessible nerve-points or nerve-trunks, but if these are found and are pressed upon or rolled between the fingers, the sensitiveness is extreme, as it is also if muscle-masses are pinched or squeezed between the fingers, probably because of the inflammation in the nerves of the skin, subcutaneous tissues, and muscles: although as a true myositis it is sometimes concurrent with neuritis, this may be the explanation in part of the pain.

Local spasmodic phenomena are occasionally observed in the acute and subacute as well as in the chronic variety of neuritis, as are also increased perspiration or other abnormality of secretion, joint effusions, changes in the skin and subcutaneous tissues, redness and swelling even at times to the extent of œdema, the condition which was first described by Mitchell, Morehouse, and Keen as "glossy skin," and herpetic and other eruptions.

Chronic neuritis is usually the sequence to an attack of acute inflammation, with perhaps an intermediate subacute stage; but sometimes the symptoms are subacute or practically chronic from the first. Pain is a nearly continuous symptom, and has exacerbations under such exciting causes as weather changes, irregularities of diet, and nervous excitement. This pain is usually described as dull, aching, or gnawing. Tenderness and paræthesias, while present, are not so severe and annoying as in the acuter forms of the disease. As more or less degeneration of the nerves affected has usually taken place, the results of this degeneration are to be found in diminutions and losses both of sensation and motion. Commonly all the forms of sensation are depressed or lost. Paresis or paralysis will be shown in degree according to the motor nerves involved. In some cases of chronic degenerative neuritis anæsthesia predominates over motor paralysis, but in other cases the motor paralysis is more marked. Muscles as well as nerves degenerate, and changes in the electrical reactions of nerves and muscles of course occur; while trophic disturbances, such as changes in the hair, nails, skin, and joints, are common.

The total picture of a case of neuritis will depend largely upon its localization and intensity. It may be of any extent from mild inflammation of peripheral nerve-endings or short reaches of a nerve-trunk to a severe affection spreading through an entire limb or even all the limbs, sometimes indeed diffusing until it includes in its painful and destructive march nerves, like the pneumogastric, the integrity of which is necessary to life.

The acuteness, subacuteness, or chronicity of neuritis may have an important bearing upon its treatment. Remedies of great value in the acute stage, as leeching, cupping, mercurials, salicylic compounds, rest, etc., may be useless or even harmful when the disease has become chronic. In the chronic disease electricity in the form of strong galvanic or even faradic currents, massage, Swedish movements, and even active gymnastics and exercise, may be most efficient, while in the acute and even in the subacute stages such measures might simply tend to increase irritation and inflammation, especially in unskilled hands. When neuritis passes into a subacute period or has been practically subacute from the first, too aggressive treatment may result in damage. Rest, gentle massage, and moderate doses of remedies which will be referred to hereafter, such as phenacetin, salol, salicylate of sodium or of cinchonidine, will prove most serviceable, while a too active and depletive treatment, such as would be suitable for acute sthenic neuritis, would do harm by its depressing effects upon the patient. Points with reference to the differences of treatment according to the stage or intensity of the neuritis will appear as we discuss special varieties.

The distinction between neuritis and neuralgia, using the latter term to designate a particular disease and not simply to describe pain in the course of a nerve, is one that should be made by the therapeutist. Many cases formerly regarded as neuralgias are now classed under the head of neuritis, and many of the diagnostic points formerly given to prove the existence of true neuralgia cannot be depended upon positively; but in spite of the difficulties of differentiation, the best authorities still hold to the existence of two distinct diseases, the neuralgias proper being probably due to molecular disturbances in the nerve-trunks or nerve-centres. In neuralgia the nerves affected are not the seat, or at least not the continuous seat, of tenderness. A neuralgia often shifts from one place to another, and the pain is more intermittent; it is not associated with anæsthesias and paralyses. Swelling of the nerve and of the adjacent parts is not present in neuralgia as in neuritis. It is difficult to distinguish between a mild neuritis and a neuralgia. Sometimes an inflamed nerve is so situated that it cannot be reached and tested for tenderness, so that the diagnosis may have to remain undetermined.

The treatment of a true neuralgia for some indications, as the immediate relief of pain, is the same as that of neuritis, but for others it differs essentially. Neuralgias are often accompanied by conditions of exhaustion which contraindicate remedies like antipyrine, gaultheria, and the salicylates, which do so much good in some cases of neuritis. In acute neuritis such drugs as strychnine, arsenic, iron, phosphorus, the copper and zinc salts, which are of great value in neuralgias, may not be called for. Operations like acupuncture, nerve-section, nerve-stretching, etc. are more useful in neuralgias than in neuritis.

Neuritis may be of any nerve of the body. Numerous disorders which are in their beginning or at periods of their progress examples of neuritis are discussed under various heads, as under facial paralysis, ptosis, radial paralysis, spasmodic tic, torticollis, etc. It is important, however, to bear in mind the original inflammatory nature of many of these affections, as the prominence of such symptoms as paralysis or spasm seems sometimes to mask to the physician the fact that they are dependent upon neuritis or perineuritis, and in consequence appropriate antiphlogistic treatment is neglected, or remedies such as electricity and massage are begun too soon or are used too vigorously. In all forms of local paralysis neuritis after a time results in degenerated or atrophied nerves, with which we have to deal rather than the original inflammation; but the point I wish to emphasize is that for the purposes of treatment the physician should always first consider whether any real neuritis, acute or subacute, still remains.

The most common forms of facial or Bell's paralysis are examples of rheumatic neuritis due to cold or exposure, or they are syphilitic or traumatic. In these cases the importance of early active treatment is not properly appreciated. As soon as a case of rheumatic facial paralysis is recognized treatment by leeches externally, and internally by such remedies as the bicarbonate or citrate of potassium, or by salicylate of sodium, salol, salicin, or oil of gaultheria, or by mercury, particularly in the form of calomel, should at once be instituted; and in addition rest of the face and mental and general rest as far as possible should be enforced. As soon as the most acute symptoms have subsided the iodides should be used, and even after some degeneration has occurred, as some inflammation also usually remains, these remedies in reduced doses should still be continued. Later, electricity, and tonic and reconstructive remedies, such as strychnine, quinine, iron, malt, and cod-liver oil, have their place. In syphilitic facial paralysis—which can often be diagnosticated by the fact that as the lesion is usually intracranial, although peripheral, the auditory as well as the facial nerve is involved—the most active specific treatment by mercurial inunction or corrosive-sublimate injections, or large doses of the iodides, should be pushed. Often a gumma and accompanying neuritis are both present.

The auditory nerve, like the facial, may be attacked by syphilitic disease or may be involved in a syphilitic tumor, and may even, although rarely, be the seat of a primary neuritis.

Oculo-motor paralysis in a large majority of cases is due to syphilis, and frequently the lesion is a primary syphilitic neuritis, although occasionally, as in facial paralysis, the primary lesion is a gumma of the membranes, neuritis accompanying the tumor. The importance both of early and of persistent treatment of such cases by specific remedies cannot be overrated, although, after the paralysis has entered upon its chronic stage, electricity, tonics, and reconstructives must also play an important part. Some authors regard oculo-motor neuritis, like facial neuritis, as usually of rheumatic origin, but this is not my personal experience. When the paralysis is total—that is, of all the branches of the third nerve—it is usually due to syphilis. When the more external branches of the nerve are alone involved it is more likely to be rheumatic. The syphilitic cases do better on mercury and the iodides, while the rheumatic will sometimes yield more promptly to the active exhibition of the salicylic preparations. Mercury and the iodides, however, are useful in the subacute and chronic stages of both rheumatic and syphilitic neuritis of these and other nerves.

Paralyses and sensory affections in the domain of the fifth or trigeminal nerve are sometimes due to primary neuritis, although this form of inflammation is not as common as secondary neuritis associated

with a growth or extension of disease from bone, membrane, or sinuses. Owing to the destructive affections of the eye, such as ulcers or sloughs of the cornea and conjunctiva, the importance of an early recognition of inflammatory affections of this nerve and their aggressive treatment cannot well be over-estimated.

I have seen a few instances of losses and perversions of taste apparently dependent upon toxic neuritis which originated through substances taken into the mouth or from constitutional infection or poisoning. Olfactory disorders are often due to disease of the centre for smell in the cerebrum, or to tumors or other lesions complicating the olfactory bulb, but occasionally are the result of a primary neuritis. In rare instances we have coincident involvement of both the distribution of the olfactory nerve to the Schneiderian membrane, and of the first and second divisions of the trigeminal to the mucous membrane of the nose, the combination giving disturbances, both of the sense of smell and of common sensations. An effort should be made to separate these gustatory and olfactory cases, and if it is determined that they are due to neuritis, particularly of the primary form, a more hopeful prognosis can be given. In such cases we have just as much reason as in a case of diffused or multiple neuritis for the use of such remedies as mercury, iodides, salicylic compounds, and later electricity, strychnine, and other tonics.

Of course optic neuritis in the vast majority of cases is secondary to intracranial disease, particularly tumor and meningitis. It may, however, be a primary affection, and if so is most likely to be of rheumatic origin. Gowers speaks of three instances of this kind, all in women, two of whom had previously suffered from neuritis of the facial nerve, and the other had had manifestations of rheumatism after exposure to cold. The therapeutic importance of such a fact as this is at once evident.

Both the spinal accessory and hypoglossal nerves are sometimes attacked by rheumatic neuritis, most probably in their distribution outside the cranium. Accessory neuritis is not infrequent as an accompaniment of caries of the upper vertebræ, and this nerve, like other nerves of the neck, sometimes is the seat of an inflammation originating from the swellings and suppurations of the cervical glands. Attention to the cause of the neuritis is here of great importance, and active counter-irritation or cold to the neck may be of great service.

The phrenic nerve is so situated that it is not rarely involved in disease of the neighboring parts, as in aneurisms of the large vessels of the neck, mediastinal and other tumors, and diaphragmatic pleurisies. In these cases the nerve may only be affected by pressure or a secondary neuritis may be set up and become serious. The phrenic centre in

the cord is sometimes included in intraspinal disease or injury or is reached by an ascending neuritis. Primary neuritis affecting this nerve is a rare affection, and commonly arises after great exposure of the neck or from toxic or infectious influence. The internal treatment in such a case should of course be the same as that for neuritis of other types, with the addition, however, of remedies such as strychnine and caffeine, and active counter-irritants over the lower or inner portion of the neck, and perhaps also over the diaphragmatic region.

Pneumogastric neuritis, both as an affection secondary to tumors, aneurisms, and other gross lesions, and as a primary disease, is rare, but has been observed; and without doubt this nerve is sometimes invaded in multiple neuritis, the fatal issue being thus sometimes determined in cases occurring after diphtheria and scarlet fever, or from arsenical or other poisoning. Bearing this fact in mind, when cardiac and respiratory failure is threatened in such cases, in addition to the usual treatment for multiple neuritis strenuous efforts should be made to stimulate the nervous centres by such remedies as atropine, strychnine, and caffeine. Digitalis may also prove of service.

Radial paralysis or unilateral wrist-drop is a comparatively common affection, often due to pressure, as from a drunken man sleeping heavily on his arm, but in other cases the result of exposure, and therefore a rheumatic neuritis. Even when induced by pressure some traumatic neuritis is usually present. The median, ulnar, and circumflex nerves are less frequently, and yet not rarely, the subjects of inflammation. In all such cases, particularly in the early stages, the inflammatory nature of at least a portion of the affection must be borne in mind. Treatment with such remedies as massage, Swedish movements, and galvanic electricity must not be begun too soon, although of great value in the later stages of the diseases. Active counter-irritation with mustard, thapsia plasters, or blisters is often of great service early.

The brachial plexus or any one or several of its branches is not infrequently the seat of primary or secondary neuritis. In diabetes I have seen generalized brachial neuritis with pain and tenderness of the most extreme character. In one instance it yielded to large doses of the salicylate of sodium frequently repeated, with complete rest and the hypodermic use, twice daily, of morphine and atropine.

The occurrence and treatment of neuritis involving the lumbar or the sacral plexus, or both of these plexuses at the same time, is a subject which has not received the attention it deserves. Sometimes the sacral plexus, and by extension through the lumbo-sacral cord subsequently the lumbar plexus, become included in neuritis which has begun in the great sciatic nerve and ascended. I have elsewhere[1] considered at some

[1] *Medical News*, June 15, 1889.

length the comparative frequency of the lesions of these plexuses, which embrace cases of spontaneous neuritis and of secondary neuritis, and of pressure disturbances resulting from neuromata, non-neural growths implicating the nerves, aneurisms, abscesses, gunshot and other injuries, and rectal, ovarian, or uterine diseases. In every case of unilateral or even bilateral pain in the extremities the sacral plexus should be examined carefully by palpation through the rectum. Probably some of the cases of anal and perineal neuralgia reported by Mitchell and others have been instances of neuritis beginning within the pelvis or somewhere in the distribution of its nerves. The diagnosis of lesions of either or both of these plexuses having been made out, treatment should be directed to the cause of the neuritis if the nerve-inflammation is secondary, and whether secondary or primary certain special lines of treatment in addition to those ordinarily used may be found serviceable. Among these would be included complete rest in bed, counter-irritation both in the perineal and sacral region, and the administration by the rectum, and sometimes even by the vagina, of narcotic and anodyne suppositories. In several cases of plexus neuritis I have seen persevering mercurial inunction, local rest, anodynes, and tonics dissipate the affection.

Under such names as anæsthesias, peripheral anæsthesias, paræsthesias, numbness of the extremities, etc. are included various forms of neuritis, and these may call for special plans of treatment. Cold, alkaline caustics, strong narcotic solutions, and various kinds of local irritants will set up irritation, congestion, and even inflammation of the peripheral nerves and their end-organs in the skin; so that these anæsthesias and paræsthesias may represent a dermal or a more deeply-extending true neuritis. Laundresses, cooks, washerwomen, and dish-washers, particularly in boarding-houses and hotels, suffer in this way. Motor disturbances are usually absent, the affection being of the sensory or vaso-motor nerves. Various vascular or even trophic phenomena, such as coldness, pallor, blueness, flushing, heat, swelling, ulcers, or abscesses, may accompany the anæsthesias. In or after any infectious or toxic disease, instead of a widespread multiple neuritis or a neuritis limited to some definite nerve-trunk and its branches, we may have cutaneous anæsthesia or muscular anæsthesia, or both combined; as, for example, numbness of either feet or hands, of the tongue, or of the lips. Frequently these sensations are dependent upon mild grades of inflammation, and the best treatment is based upon a recognition of this fact, The affection described as "numb fingers" is probably a slight form of multiple neuritis. Syphilitic neuritis, which usually takes the form of loss of pain and temperature senses, shows a tendency to occur on the breasts and the backs of the hands, although it may appear anywhere. "Numerous cases of indefinite

nervous symptoms," says Starr, "pain of various kinds, formication, and odd sensations grouped under the indefinite terms numbness, flashes of cold and heat, accompanied by actual changes in the temperature of the part or only by apparent vascular irregularities, slight spasms or tremors; functional weakness, with sense of fatigue, not reaching the grade of paresis, and many equally obscure manifestations of disturbed function in various parts of the body, receive their best explanation in the theory of multiple neuritis." [1]

The majority of cases of so-called sciatica are instances of neuritis, often of the rheumatic type, although the occasional occurrence of true sciatic neuralgia has not been thoroughly disproved. In the acute and subacute stages of this disorder the value of rest should not be overlooked. If possible, this rest should be absolute. One of the best methods of accomplishing this is by putting the patient to bed and even applying a splint to the limb—a method first advocated by Dr. Weir Mitchell. Of course in mild cases this is not necessary. In sciatic neuritis, as in many other forms of nerve inflammation, cold is very serviceable, and has been advocated by Mitchell, Jacoby, Graeme Hammond, and many others. Cold can be applied by means of ice-bags packed against the posterior surface of the thigh, as recommended by Hammond, or sprays of chloride of methyl or ether may be used, but the latter have been objected to because of the rapidity with which they produce freezing of the skin. Recent acute cases of sciatica sometimes yield very rapidly to large doses of oil of gaultheria, the salicylate of sodium, the salicylate of cinchonidine, or salol and phenacetin. This treatment is well supplemented by complete rest and one or two injections daily or every other day of morphine and atropine. These are therapeutic facts which suffice to show that the disease is a true neuritis. Chronic sciatic neuritis is better treated by such remedies as Donovan's solution, oil of turpentine, or iodide of potassium or sodium, combined with the salicylate and the bromide of sodium and the external use of strong galvanic currents or vigorous massage. The use of massage in chronic sciatic neuritis is deserving of a few special words. Owing to the deep-seated position of the nerve, it should be vigorous in character, and hacking, a form of strong percussion from the elbow, is sometimes of great service here. Wherever a nerve-inflammation is of moderate or varying grade, but of great persistence, the use of active and skilful massage will often answer a good purpose, and in sciatic and other forms of neuritis, when chronic, strong galvanic currents are of great service.

While nerve-stretching is perhaps more generally useful in neuralgia than in neuritis, it will sometimes be found of service in intractable

[1] The Middleton-Goldsmith Lectures, *Medical News*, during January, 1887.

chronic cases of the latter disease. In a case of localized sciatic neuritis of three years' standing Dr. Deaver stretched this nerve for me with entire success, although the case had resisted most active treatment of various kinds.[1] "Operation is useful," according to Deaver,[2] "in two or three ways—either by allowing the nerve a better chance to repair, by opening the sheath and breaking up any adhesions that may be present, or, when degenerated, by disturbing the molecular condition of the nerve and stimulating it to take on regenerative action; or, again, in those cases of chronic inflammation of a nerve in which physiological movements never allow it to be sufficiently long at rest to accomplish a cure, by removing a section of the inflamed nerve and thus getting rid of the constant irritation."

Multiple Neuritis.—The disease known as multiple neuritis is deserving of particular consideration, owing to its extent and peculiarities. As its name indicates, it is a widespread inflammatory affection of many nerves, and may be due to a great variety of causes, but usually is toxic or infectious. Spontaneous or sporadic cases have been frequently reported, but probably in these the underlying cause has escaped discovery. Alcohol is one of its most frequent causes, but lead, arsenic, copper, carbon bisulphide, carbonic oxide, ergot, jaundice, uræmia, diphtheria, scarlet fever, measles, smallpox, typhoid and typhus fevers, tuberculosis, influenza, leprosy, mumps, cholera, syphilis, puerperal infection, rheumatism, gout, and diabetes, have all been recorded as originating it in particular cases.

The symptomatology of this affection is complex. Patients complain of all sorts of pains and abnormal sensations referred to various nerve-distributions, and, it may be, to muscles, joints, and the internal viscera. Coldness, various paræsthesias, impairment of sight and hearing, and constitutional disturbances, such as fever, rigors, and delirium, are often present at the start. The objective symptoms are sensory, special sensory, motor, paralytic, ataxic, spasmodic, electrical, reflex, vaso-motor, and trophic, and do not in essence differ from those which have been already mentioned in speaking of the general symptomatology of neuritis; but they are usually intense in character, widespread, and often eventually such as to threaten the life of the patient. The disease frequently complicates or is complicated by other affections of the peripheral or of the central nervous system, such as myelitis, meningitis, meningo-myelitis, or meningo-meningitis.

Besides the subdivisions into acute, subacute, and chronic, and into etiological varieties, multiple neuritis may be conveniently classified, particularly for the purposes of treatment, into cases of mild, moderate, and severe type. Moderate and severe, but curable, cases may

[1] Deaver and Mills, *Journ. Nerv. and Ment. Dis.*, Dec., 1890.
[2] *Med. News*, Aug. 8, 1891.

be subdivided into four stages, although these stages may vary much in length and in severity. The first stage is that of onset; the second is that during which the symptoms show a tendency to remain at the same plane; the third is that of paralysis and wasting the result of the nerve-degeneration which has followed the inflammation; the fourth is that of convalescence and restoration of lost structure and functions. Some cases of multiple neuritis never pass the first stage. They are explosive, violent, and rapidly fatal, the neuritis extending from the nerves of the extremities to those of the trunk, and even to the phrenic and pneumogastric, ending fatally in a short time from respiratory and cardiac paralysis. The term "apoplectiform" can be properly applied to these cases, and to others which may recover, but which come on abruptly and with violent symptoms.

To guard against the occurrence of neuritis after infectious fevers and exhaustive diseases constructive and nutrient remedies and easily assimilable food should be given, and close attention should be paid to the hygiene of clothing, air, and exercise. Depression of general health adds much to the liability of the occurrence of the post-febrile forms of nerve inflammations.

In the early stage, particularly of severe cases, the treatment should be actively and aggressively anti-inflammatory. The suffering of some of the patients affected with multiple neuritis is almost indescribable, and it is of the utmost importance to relieve them promptly if possible. In the first place, the patient should be put as nearly as may be at absolute rest, in the full meaning of the word absolute. Attention should be paid to the character of the bed, which should not be too hard and should be as free as possible from knots and ridges. Much the same care should be taken with patients of this kind as with cases of fracture: the handling and movement necessary in feeding the patient or in attending to his evacuations should be reduced to a minimum.

In a few cases bloodletting may be of advantage. Before resorting to general bloodletting, however, the patient's general condition should be carefully considered. Many old alcoholics are broken down and would react badly from general bloodletting. A very limited number of cases, however, with sthenic symptoms and with evidences of congestion or inflammation of the brain and spinal cord in addition to the neuritis, can be advantageously treated by careful venesection.

In nearly all alcoholic cases the patient should be at once deprived entirely of alcohol. Occasionally a measure so heroic as this might have some danger in old topers, but in the majority of cases the alcohol should be withdrawn at once, and I have rarely seen any harm result from this procedure. If the use of any alcohol is re-

tained, it will be best given in the form of a weak milk punch two or three times a day. While, however, the alcohol should be removed, the patient should be carefully nourished. In order to accomplish this, the condition of the stomach must be carefully considered.

The symptoms calling for immediate attention are sensory. The pain and tenderness must be relieved. Various local applications have been recommended and may be tried. One difficulty is the large surfaces which must be covered—entire limbs, and almost the entire body in some cases. Very hot fomentations or poultices can be applied to the limbs every two or three hours for ten or fifteen minutes at a time. Instead of these, rapidly alternating applications of very hot and very cold water may be used, but care should be taken when these are resorted to not to be careless or slow. A large sponge or soft towel is dipped first in very hot and another in very cold water, and one is made to follow the other rapidly up and down the limb. If used properly, this makes an agreeable and useful method of local sedation or counter-irritation.

Opiates in various forms can be used for the relief of pain. One of the best methods of administration is hypodermically giving $\frac{1}{6}$ grain of morphine and $\frac{1}{100}$ or $\frac{1}{120}$ grain of atropine. The hypodermic injection need not be given in the most hyperæsthetic areas. One, two, or three injections a day may sometimes be resorted to with advantage. It is a good plan in the early stage to give an anodyne and febrifuge, as a mixture containing morphine, with citrate of potassium, spirit of mindererus, and camphor-water. If the patient has a weak heart and is broken down from alcohol or other cause, care must be taken in the administration of remedies; and it is well sometimes in such a case to give good-sized doses of nux vomica, strychnine, erythroxylon, or preparations of cinchona. Nourishment in the form of milk, beef-extracts, tender meats, and soft foods generally must certainly be given.

In the early stages particularly, and in any stage in which pain and hyperæsthesia are prominent manifestations, salicylic acid, salicylate of sodium, or some other salicylate, salicin, salol, or oil of gaultheria—all remedies, of course, of the same general character—may be administered with great advantage. Which of these various preparations should be first selected it is somewhat difficult to say. My own preference is to begin with the salicylate of sodium, in a dose of 15 to 20 grains repeated every four hours, or even oftener at first, watching the patient's condition and diminishing the dose if it appears to weaken him. In some cases 30 grains of the salicylate of sodium can be taken as often as four or five times a day, and cause speedy relief of the most painful symptoms. When a rheumatic element is present this treatment is one of the very best. Of the drugs allied to

sodium salicylate, oil of gaultheria is next in value. It is wonderfully efficacious in relieving nerve-inflammation, but unfortunately, owing to its acrid properties, it sometimes disagrees with the stomach and may prove depressing, like all the salicylic preparations. It can be used in doses of from 5 to 20 minims. In severe cases of neuritis it is perhaps better to begin with doses of 10 to 15 minims, administered in an emulsion so as to give a table-spoonful dose. When cerebral symptoms are prominent, it will often be found advantageous to administer bromide of sodium, potassium, or lithium, or antipyrine or antifebrin, in addition to the salicylates or iodides and to the use of opiates and local applications.

In cases with a syphilitic history I have found the best results from the conjoined use of inunctions of mercury and the internal administration of sodium iodide and sodium bromide in doses of from 15 to 20 grains each. Malarial cases should be treated with large doses of quinine and arsenic, or of the salicylate of quinine or of cinchonidine. In lead cases ammonium chloride, and either potassium or sodium iodide, should be resorted to to assist in elimination. Cases due to mercury or arsenic are to be treated on general principles, eliminating or constitutional remedies not proving so serviceable. In lingering chronic cases hypodermic injections of strychnine should be tried.

Among remedies that have been suggested to assist in bringing about restitution of the inflamed and degenerated nerves is methylene-blue, which can be given in capsule or pill form in doses of 1 to 3 grains.

Baths, warm, hot, electrical, or medicated, are useful in the subacute or chronic stage of multiple neuritis. These should be used as often as possible, but always carefully, not unduly exposing the patient in a cold room or allowing the limb to grow cold or to remain too long wet. The baths may be either local or general—the feet or a limb may be placed in the warm or hot water or the whole body may be carefully immersed. Ordinary warm baths are best used at night and will help the patient to sleep.

Massage and Swedish movements are remedies of great value if used in the appropriate stages and in the correct way. In the first place, it is not well either to begin too early or to wait too long. In the most acute stage or in the most severe varieties of multiple neuritis even the gentlest massage would be practically impossible. The patients can scarcely endure to be touched, let alone to have stroking, kneading, etc. employed. On the other hand, it is not advisable to wait until all pain and tenderness have disappeared. When the superficial tenderness and the extreme pain have subsided massage should begin, and it should at first be of the gentlest character and only for a brief time; gradually both the thoroughness and the length of the treatment should be

increased, until eventually massage in all its varieties—stroking, friction, kneading, and percussion—should be thoroughly employed over a period of at least an hour. It is in the stage of subacute or chronic neuritis that the duration of the entire case can be largely modified by massage and galvanism.

Anodyne and resolvent ointments may be applied by means of massage. A good ointment to use for the relief of pain and for actual effect upon the neuritis is aconitine ointment or aconitine made up with lanoline. Even small quantities of mercurial ointment or a mixture of mercurial and belladonna ointments may be used in this way. Morphine, atropine, hyoscine, etc. may be added to the oleates or to vaseline. Liniments made up with oil may be used during a whole or part of the general massage. Thus, sweet oil, cocoanut oil, etc. may be combined with tincture of aconite-root or chloroform, or the oil of origanum may be used in some combination in a liniment.

If the patient stands it well or is improved by means of massage, either simple or medicated, in the course of two or three weeks, Swedish movements, at first of the passive and later either of the duplicated active or of the independent active variety, can be used. Just how far these may be employed with advantage can be told by a masseur or a masseuse of tact and experience. Returning movements are to be coaxed, the will is to be trained back into the muscles, contractures are to be carefully overcome—in fact, the patient's unfolding neural and muscular powers are to be encouraged and helped onward. With massage, Swedish movements, and electricity properly employed the length of the period of recovery and restoration may be decreased by weeks or even by months.

Electricity is used in several ways for as many indications. In the very acute stages it should not be resorted to at all; but when the excessive pain and hyperæsthesia have in a measure subsided, mild galvanic currents, uninterrupted and passed through a sponge or absorbent cotton electrodes of two or three inches in diameter, are sometimes beneficial, even in the relief of the pain and inflammation. Experience should guide in this matter. If a patient is made worse by one or two mild applications, further treatment should not be given up entirely, but should be postponed for another week or two. This use of galvanism with weak currents and large electrodes is for anodyne purposes. The Adamkiewicz's electrode for the application of such remedies as chloroform by means of electricity is worthy of trial. After the active inflammation has largely or altogether subsided, electricity, either in the form of galvanism or faradism, will assist in the restoration of the degenerated nerves and muscles.

BERI-BERI.

Beri-beri is a term used in certain parts of the East Indies to describe an endemic or epidemic affection, chiefly a multiple neuritis, in which the phenomena are œdema and paralysis of the limbs, with marked pain, paræsthesia, and hyperæsthesia, followed by marked anæsthesia, lost knee-jerk, and changed or lost electrical reactions. The disease is usually described as having two forms—the paralytic and the hydropic or œdematous, or sometimes a combination of both, and the majority of the cases are of the hydropic or œdematous variety, with paralytic symptoms. It may be either acute or chronic, and sometimes the acute variety is rapidly fatal, unless treated aggressively, and even in spite of treatment. Effusion frequently takes place in the serous cavities, and the heart is decidedly affected. The chances of recovery are better in the paralytic form, because the danger of death is less from dropsy, pulmonary œdema, or cardiac paralysis.

Wernich, according to Weintraub, recommended puncturing the skin and tapping to relieve hydrops, but such measures are not to be recommended. Weiss, Lodewyks, and others recommend the muriate of pilocarpine subcutaneously, the latter claiming for it marked diuretic as well as diagnostic properties. Digitalis, because of the degenerated heart-muscle, must be given cautiously for the relief of the palpitation. Claret and cognac are given to stimulate and assist digestion. As long as the patient is able moderate outdoor exercise is urged, and after that electrical stimulation of the muscles. In the death agony stimulants are given. More important than all is the removal of the patient quickly from the endemic region to a mountainous district where the disease has never existed. Prophylaxis is the only way in which to meet this disease with success.[1] Many of the suggestions with reference to multiple neuritis in general will apply to beri-beri.

[1] Mills and Lloyd, *Annual Uni. Med. Sci.*, vol. i, 1888, pp. 138, 139.

SPASMODIC AFFECTIONS OF THE NERVOUS SYSTEM.

By JOSEPH COLLINS, M. D.

CONVULSIONS OF CHILDREN (ECLAMPSIA INFANTUM).

The name "infantile eclampsia" should be reserved to indicate those convulsive attacks occurring during the first two years of life which are not dependent upon organic disease of the nervous system, but arise from irritation of various parts of the body. Convulsions the result of slight causes are much more apt to occur in young children than in adults. They are symptomatic manifestations. It will readily be seen that it would require consideration of many diseases to discuss the causes of convulsions in detail. Convulsions of children are much more frequently epileptic than is usually believed. In attempting to fathom the origin of infantile eclampsia it should always be kept in mind that convulsions are an expression of irritation of the motor areas of the cortex or of the convulsive centres in the brain-ganglia, pons, and oblongata, which irritation may be direct and mechanical, as from a clot or spiculum of bone; direct and chemical, as from the circulation of peccant matter in the blood; it may be indirect, from the transmission of sensory irritation from some adjacent or distant part of the body, such as the alimentary tract, the nasal mucous membrane, the sexual organs; or it may be a manifestation of idiopathic epilepsy. Convulsions of children may also be considered as of organic or functional origin, but the classification I have mentioned has the advantage that it indicates, in a measure, the way in which they are caused.

After the origin or source of an attack of convulsions has been determined there are two things incumbent: one, the removal of the cause so far as possible; the other, the treatment of the attack itself.

Treatment of the Causes.

In some instances it will be possible to remove the cause, as, for instance, when the attack is due to indigestible substances in the stomach and bowels, to cholera infantum, dysentery, constipation,

swollen gums associated with the eruption of the teeth, organic poisons in the blood and the urine, such as urea and glucose; but in other instances in which the cause is of an organic nature and the attack are the expression of some mechanical and irritative condition, such as meningeal hæmorrhage, products of inflammation, and new growths in the tissues of the central nervous system, removal of the cause will be impossible, although some measures may be taken for its alleviation.

Of the convulsions of children we are concerned chiefly in the treatment of those that have no organic or focal basis in the central nervous system. I shall therefore make no further mention of the cases that occur with diseases of the meninges and brain, or those that occur as the first symptoms of idiopathic or hereditary epilepsy, and shall consider only those that are sometimes referred to as of reflex origin—meaning by that designation a central manifestation of peripheral irritation.

Convulsions are powerfully predisposed to by hydræmic and other impoverished conditions of the blood, such as occur with rachitis, and after acute infectious diseases. They may occur without any other cause than loss of blood. When any of these conditions can be made out in children with convulsions they should receive particular treatment; in grave cases transfusion of normal salt solution should be performed.

The condition of the buccal cavity and the gastro-intestinal canal should be investigated with great care in every case of eclampsia infantum. Swollen, inflamed gums should not be treated by cutting them, or by giving the patient something to bite on; such measures add to peripheral irritation, which is already excessive to a pathological degree. They should be treated by antiphlogistic applications such as cold to the outside of the face and diluted solution of aconite and iodine locally. If there is reason to suspect the presence of indigestible substance in the stomach a brisk emetic, such as ipecacuanha, should be administered, and then the intestine irrigated or a cathartic given. If constipation exists, a clyster should be employed. A suspicion of intestinal worms justifies the administration of any of the well-known anthelmintics, such as santonin, and saline cathartics, after which the stools should be scrutinized for small worms and sections of tape-worm, and, if these are found, remedies adapted to their expulsion given. Careful examinations of the urine and of the blood are of the greatest service, and any deviations from normal which such examinations reveal should be rigorously combated. If an adherent prepuce or any other discoverable source of peripheral irritation can be found, it should be corrected as soon as possible.

When convulsions are apparently excited by hyperthermia, the most

beneficent results follow putting the patient in a bath of from 85° to 75° F. and letting him remain there from fifteen to thirty minutes, manual friction being used toward the end if the condition of the circulation demands it. If this is not feasible, the same object can be attained by cold-water ablutions or the application for a short time, of the cold pack; an ice-bag being placed on the head.

Convulsions occur very frequently in rachitic children, and when there are evidences of this profound depravity of nutrition active measures, dietetic and medicinal, should be taken for its cure. Phosphorus, cod-liver oil, arsenic, quinine, the vegetable and mineral acids, may be given for their constitutional effect, and at the same time small doses of valerian or the bromides for their transient symptomatic effect.

Treatment of the Attack.

When a physician is called to a child with convulsions the urgency of the symptoms, both on account of the parents' comfort and the patient's welfare, often does not permit of prolonged search for the cause. On account of the mortality of eclampsia infantum (about 10 per cent.) it is necessary to check the severity of the spasm at once. For this purpose, no hesitancy should be had in using inhalations of chloroform or nitrite of amyl, or a mixture of equal parts of these substances, naturally with great precaution, until the tonic or tonico-clonic spasm (which these convulsions frequently are) begins to subside. After this, search may be made for the cause, and, if it be easily determined, measures specifically directed to its alleviation should be taken. At the slightest evidence of recurrence of spasms the inhalations should be repeated. It is rarely ever necessary to carry the patient into even a slight state of narcosis; a much lesser degree than that produced during parturition is generally sufficient. Domestic measures, such as immersing the patient in warm or hot water and mustard baths to the feet, are of very little use, and the time consumed in their application is wasted and ought to be employed in the way that I have indicated. Putting the child in a moist warm pack, with ice to the head, after the first convulsion, will very often prevent a second attack, and so will immersion for a long time in a lukewarm bath.

After the severity of the convulsion has been coped with, or after the attack has ceased at least temporarily, bromide of potassium or sodium in doses to suit the age of the child should be given, and kept up for a few days, while the child is kept absolutely quiet in bed and is placed on the simplest and most easily digested food. If the child is of such an age that it is still nursing, there is of course no reason to change this, except that it should be supplied in small quantities.

Drugs that have repute as antispasmodics or anticonvulsives, such as valerian, asafœtida, and belladonna, may be given; but, as a matter of fact, if anything else is necessary—a rare event—the most potent of all anticonvulsives, opium, can be used.

When the convulsion is an accompaniment of scarlet fever, measles, pertussis, malaria, pneumonia or other infectious disease, as it is sometimes, the measures that have already been mentioned for combating the attack should be made use of, and afterward an attempt should be made to mitigate the severity of the disease. In such cases it is generally the high temperature that is provocative of the convulsion, and it should be borne in mind that hyperthermia, it matters not with what disease it occurs, is most safely and quickly combated by the use of cold water.

Laryngismus Stridulus.—A local form of convulsion—laryngismus stridulus, or cerebral croup as it is sometimes called—which occurs almost exclusively in children who are so profoundly rachitic as to present craniotabes, requires particular mention. It comes on with such abruptness and the symptoms soon become so alarming that oftentimes it is necessary to use heroic measures, such as tracheotomy, to spare the child's life. In the ordinary case the treatment required is to lift the child from the bed, throw the head back so that air can enter the respiratory passages with facility as soon as the spasm relaxes, pull the tongue forward, throw cold water against the body, or subject the skin to smart flagellation in order to stimulate the inspiratory centre to take the prolonged inspiration, which it always does accompanied with the whoop when the spasm relaxes. If it is possible to make the patient inhale at all, a few drops of chloroform or of nitrite of amyl will quickly terminate the spasm, and whenever they are at hand and can be utilized this is the treatment to follow. In some instances wrapping a compress wrung out of hot water around the throat and then throwing cold water against the surface of the body are quickly efficacious.

If the spasm is persistent and the child's life is despaired of, there should be no hesitation in opening the trachea to admit the entrance of air; but in cases in which the ordinary measures do not suffice to relieve the spasm promptly it is advisable to give a small dose of morphine hypodermatically. This is usually soon followed by a relaxation of the spasm.

Attacks of laryngismus stridulus usually terminate before the physician has time to reach the patient. His duty then is to prevent a recurrence of the symptom. This can be done by the administration of bromides, valerian, asafœtida, etc., for their symptomatic effect, and afterward making use of every possible measure to combat the depravity of nutrition which allows the symptoms to occur. The

condition of the uvula should be investigated, for in some instances hypertrophic or inflammatory enlargement of it is the cause of the spasm. When such is the case the uvula should be shortened by operation, if treatment of the causes is not sufficient to overcome the enlargement.

TETANY.

TETANY is a motor neurosis of toxic or infectious origin characterized by the occurrence of intermittent, recurring tonic spasm in the muscles of the hand, and sometimes in other parts of the body, such as the foot, which causes it to assume a position similar to that of the accoucheur when he makes a uterine examination; increased mechanical irritability of the motor nerves (Chvostek's symptom); increased electrical irritability of the motor nerves (Erb's symptom); increased mechanical and electrical irritability of the sensory nerves (Hoffman's symptom); and by the occurrence of the cramp condition when deep pressure is made, as by the finger on the extremity wherein the spasm has been manifest (Trousseau's symptom).

Tetany is due to, or follows, many different infections and intoxications. As the treatment of the disease depends very largely on the etiology it is necessary to make brief mention of the causes. It may be caused by the activity of peptotoxins, intestinal toxins, the toxins that accumulate in the system after ablation of goitre, and by poisons generated during the course of any of the acute infectious fevers. It is sometimes caused by ingestion of one of the vegetable or mineral poisons, such as ergot, alcohol, chloroform, lead, phosphorus, and tobacco. It occurs with conditions of bodily depravity such as are induced by pregnancy and lactation, with such disorders of nutrition as rachitis, and sometimes the only attributable causes are hygienic and dietetic errors. Occasionally it follows one of the acute infectious diseases, such as typhoid fever, dysentery, and cholera. In all probability the seat of the lesion or the manifestation of the peccant activities of the poisons is the central nervous system, with sometimes a predilection for the brain, sometimes for other parts.

TREATMENT.

The treatment of tetany is first to discover the cause, render it non-operative, and if possible to get rid of it. This is not always easy to do. For instance, cases of tetany which develop with stomachic dilatation are almost always associated with chronic ulceration near the pylorus, which requires assiduous and long-continued treatment before the disease begins to subside; but this is the most fatal form of tetany—from one-half to two-thirds of the victims

succumb—while the ordinary forms of tetany not infrequently go on to recovery even if no treatment is instituted. After the causes of the disease are combated and removed, measures should be taken to prevent further impoverishment of the blood and to restore it as soon as possible to a normal condition.

When the disease occurs epidemically, the victims should be isolated, not on account of nervum contagiosum, but because the evil effects of imitation on a well child may be considerable.

The treatment of the cramp condition itself may be summed up in few words: The physician's efforts should be to allay pain and to arrest muscular contraction. The medicines that have been found most useful for these purposes are a combination of chloral and belladonna and of chloral and bromide. In very severe cases the administration of hyoscyamine and curara by means of hypodermic injection may be necessary. As a rule, the first-mentioned measures, if associated with prolonged lukewarm baths for their sedative effects upon the peripheral sensory nervous system, revulsive and stimulating applications over the spine, and light rubbing of the extremity with sedative liniments will be quite sufficient. In very rare instances the tonic spasms are so severe and so widespread that symptoms of asphyxia appear, and if such a state should occur, inhalations of chloroform to relax the spasm must be given.

The use of quinine, opiates, valerian, anti-rheumatics, etc. should never be indulged except to meet special indications, and then they are to be employed only as symptom-medicines. The same may be said of the administration of the bromides: they should never be given except for a few doses, as their action upon the blood is such that it should not be courted in a disease which is in part the effect of blood-depravity.

The galvanic current can often be used with great efficaciousness: the cathode on the back of the neck or chest, and the anode on the nerve-trunk which supplies the parts which are the seat of the spasm, and a current of considerable intensity allowed to flow for several minutes. This procedure may be repeated twice or three times a day. It does not need mention that the faradic current is to be avoided, as it would aggravate the symptoms exceedingly. The liability to the occurrence of this disease should always be borne in mind when operations on the thyroid are advised, and whenever possible the surgeon should be counselled to do a resection rather than an extirpation. When the symptom occurs after operation on the thyroid gland transplantation of thyroid as well as thyroid-feeding may have to be employed.

When the disease occurs in pregnancy, measures taken to combat the hydræmia may be sufficient to cope with it, but occasionally the

severity of the symptoms becomes so great and their occurrence so frequent that measures for terminating the pregnancy must be considered. There should be no hesitation in insisting upon weaning the child at once when tetany occurs in nursing mothers, not alone for the sake of the mother, but for the welfare of the child. When the disease occurs in young children and no cause for its appearance is to be determined, it is well to bear in mind that the symptom-complex sometimes follows the hydræmia produced by intestinal worms, and that in such cases a few sharp doses of some anthelmintic will start these patients toward recovery.

The convalescence of patients who have had tetany is often tedious, and calls for the most assiduous dietetic and hygienic supervision.

Infantile tetany is a dangerous and often fatal disease. It occurs in an active and a latent form and always calls for prompt treatment. It is almost always associated with rachitis. The digestive tract should be carefully examined and undigested substances in the stomach removed by lavage, followed by a brisk cathartic. The usual measures for the treatment of tetany may then be given.

CHOREA.

THE term chorea means literally a dance; it is commonly and properly applied to the disease which has so long been known as St. Vitus' dance and Sydenham's chorea. It is a term, however, which has been greatly abused by some writers, who apply it to a number of affections—particularly the tics—of which irregular dance movements are a striking feature. The term chorea, without modification, should be limited to designate a toxic or infectious disease which occurs almost exclusively in an acute form—usually before puberty for the first time; a self-limiting disease which runs a rather typical course, characterized by involuntary, uncontrollable, abrupt, bizarre, dancing movements of the extremities, of the face, and sometimes of the trunk, by motor unrest, myasthenia, and mental sluggishness.

Eponymic nomenclature in the medical sciences should always be frowned at and discouraged, for it usually indicates ignorance or selfishness. Sometimes, however, such nomenclature fulfils a definite purpose and is advantageous: it is so in chorea; and to refer to Sydenham's chorea, Dubini's chorea, Bergeron's chorea, and Huntingdon's chorea is to refer to four distinct and separable diseases, all of which have in common movements to which the term chorea is properly applied. The first, however, is a humoral arhythmical

disease and occurs with certain infections or intoxications of the blood; the second is an infectious disease; the third is probably merely a manifestation of a general neurosis; and the fourth is a purely degenerative disease of the central nervous system, and has absolutely nothing in common with ordinary chorea except the involuntary, bizarre, dance movements. Each of these forms will be referred to separately in speaking of the treatment, while the conditions variously denominated hammering chorea, laryngeal chorea, diaphragmatic chorea, chorea festinans, chorea procursiva, saltatory chorea, gesticulatory chorea, and so on to a most discouraging number, will be considered where they belong—under the subject of Tic. Sydenham's chorea probably always occurs as the indirect result of certain dissociated conditions of the components of the blood. These are often directly caused by rheumatism, pregnancy, exhausting diseases and habits. Directly, the symptom-complex is often prompted into being by psychical trauma, such as fright, acute worry, highly wrought anticipation, and reflexly from gastro-intestinal irritation such as that excited by the presence of worms, and very rarely from strain of highly endowed special sense-organs such as the eyes.

The significance of the occurrence of an attack of chorea is more than mere tenure of the symptom-complex indicates. In the first place, the disease occurs more frequently in those whose heritage is neuropathic, in those whose rearing has been contributory to defective inhibition of passions and appetites, and in those who are unamenable to disciplinary measures of the nursery. An attack of chorea, be it ever so slight, in a way points to the existence of a neuropathic constitution and indicates that the possessor is more honestly entitled to succumb to the harassments of life than one more stably endowed.

Treatment.

The treatment of an attack of chorea may be considered under three heads:

(1) Rest and the preservation of nutrition;

(2) Medicinal treatment;

(3) Mental and bodily hygiene.

If the treatment of an attack be carried out with the necessary attention to each of these three requirements the vast majority of choreics will recover without sequelæ or permanent injury to the nervous system. As a matter of fact the reason why chorea so often leaves its impress upon the nervous system is that most physicians content themselves with medicinal treatment alone, which, if not the least important of the three, is not so essential as the first and not more important than the last. Chorea is, like rheumatism—the disease which it resembles and which it often follows—a self-limiting

one, and if the patient is placed under favorable auspices he will recover in a period varying from six to sixteen weeks.

The importance of *rest* in contributing to the early termination of the disease cannot be overestimated, nor can the carrying out of it in the first part of the disease be overdone. It is difficult to get little patients to remain in bed all the time, but a compromise can usually be effected by having them arise late, go to bed for an hour or more in the afternoon, and retire early in the evening. Many of them are in a run-down, mentally overwrought condition, the result of persistent study, attendance at school, improper or inadequate nutrition. Consequently rest and freedom from all excitement are the most rational prescription. As has been hinted, it is most important that rest, freedom from motor activity, be obtained in the afternoon, if possible, for at this period destructive metamorphosis of the bodily tissue goes on with most activity. The question of taking the patient from school should always be answered in the affirmative, and after an attack there should be no haste in the resumption of school duties, particularly if they are at all trying and if participation in them be attended with any great strife, such as is fostered by the reward-of-merit system in many of our schools. The mental discipline and bodily hygiene of these patients must be carefully attended to after an attack of chorea, with the view of avoiding a second attack and of preventing a tendency or disposition to nervous affection.

The *nutrition* of the patient is to be fortified by the administration of digestible and assimilable nourishment in small quantities, repeated with moderate frequency, and for this purpose an ordinary mixed diet with a relatively smaller proportion of animal proteids is most useful. If the child has not yet reached the age when a mixed diet is given, absolute restriction to a milk diet should be insisted upon.

I have found that one of the best measures in contributing to the maintenance of nutrition and at the same time to the quietude and comfort of the patient, is the shock and counter-irritation of cold water poured from a height or thrown forcibly against the back of the neck and spine once or twice a day. I have also had the most salutary results, when the motor unrest is very great, from the use of the cold wet pack, especially before retiring. It is not only soothing to the patient, but contributes to refreshing sleep. For this purpose it is more serviceable than hypnotics and has the advantage that it produces no after-effects except gratifying ones. After the first one or two applications children do not rebel against it; in fact, they enjoy it.

Drugs.—The medicines that are of service in chorea are few in number. This bespeaks their real value. If no one medicament were of signal value, the number which might be recommended would

be legion. The three drugs that are of real service in the treatment of an attack of chorea are arsenic, exalgine, and quinine, and their relative value is indicated by the order in which they are mentioned. This enumeration does not of course include such medicines as iron, which is an integral part of the blood and which it is necessary to give in nearly every case of chorea.

Arsenic is by far the most efficacious therapeutic substance to influence the severity and course of an attack. It may be given in the shape of Fowler's solution preferably, or the arsenate of soda. It can be given in comparatively large doses, even to the production of slight toxic effect, such as puffiness around the eyes, nausea, vomiting, and lachrymation, but as soon as these symptoms appear the drug should be withheld until they cease; then it may be given again in the same dose that was being administered when the toxic symptoms occurred. It will be found that the patient tolerates the renewed attempts at the large doses without any complaint. The dose of Fowler's solution for a child of from six to ten years may in this way be brought up to from 10 to 15 drops in a few days. I have rarely given the extremely large doses recommended by Seguin, nor do I think that they are necessary. When the choreiform movements are of great severity, and when they do not promptly subside under the administration of arsenic and the influence of enforced rest, I have not failed to get the required effect from a few doses of exalgine.

Exalgine has never been used extensively in the treatment of chorea, yet it is a potent medicine to abbreviate the duration of an attack. It may be given in doses of from 1 to 3 grains to children under ten years, and repeated three or four times a day. The effects of the administration of exalgine, not only on the severity of the symptoms but upon the patient's appearance and vitality, are generally manifest very promptly, and the latter, if the drug has been given in large doses, may make one unaccustomed to its use somewhat solicitous. The hæmolytic action of exalgine is responsible for the early appearance of anæmia, and this, as well as the direct effect which it has on the circulatory apparatus to lower blood-pressure, sometimes produces a condition akin to collapse. The occurrence of these symptoms can be prevented by administering some soluble salt of iron very freely from the beginning of medication. I have not seen bad results follow the administration of exalgine in chorea, although in cases that have been unamenable I have carried the amount up to 30 grains in twenty-four hours, at the same time administering most liberal doses of iron. When the drug is given in extremely large doses epileptoid convulsions may occur. Naturally the greatest care must be taken to avoid such occurrence. To secure the beneficial effects of the drug it is never necessary to

give it in doses approaching those required to produce these serious symptoms. Exalgine is of greater service in very acute cases than in those that have lasted for some time, and it can often be used to advantage in the beginning of an attack, and followed by arsenic later. Were it not for the profound anæmic and collapse symptoms which it causes—for which, as I have said, iron, and sometimes digitalis, must be administered—the drug could be more highly recommended.

Quinine, the *salicylates*, and *antipyrin* have all been used in the treatment of chorea, and frequently with the most satisfactory results. It is supposed that they owe their beneficial effect to their action on the blood, it being well known that they have a direct action on the white corpuscles and the blood plaques, and by contributing to intestinal antisepsis. Their administration is recommended, in becoming doses, in cases in which it does not seem wise to administer either arsenic or exalgine, and particularly in cases in which there is a distinct rheumatic history.

A combination of chloral and bromide is often of service when the motor activity is extreme and to aid in securing sleep, but, if the wet pack be applied and the discipline of keeping the patient in bed be pressed into service, there will rarely be any need of using the chloral-bromide mixture. Bromide of camphor in from 2- to 5-grain doses in capsule-form has been highly recommended. It may be used for its sedative effect. I have sometimes had satisfactory results from the use of the bromide of zinc in cases of long standing, particularly in those cases where the patient has run the therapeutic gauntlet before coming under observation. It may be given in doses of 5 to 20 grains three times a day.

Occasionally the administration of some preparation of belladonna or hyoscyamus, especially when the vesical sphincter is derelict in the performance of its duties, is of advantage. Measures must often be taken to whet the appetite and to overcome constipation, which the profound asthenia of chorea is directly contributory to, and which the administration of iron increases.

The mental disturbances of chorea have been the subject of considerable writing. Except as a part of the asthenia of the *soma* and the *psyche* mental disturbances do not exist, and such symptoms of mental impairment as aphasia, forgetfulness, or intellectual sluggishness require no treatment apart from that taken to combat the general weakness. It should be borne in mind that all the functions of the organism are perverted in this disease in the same manner as in rheumatism, and the patient should be treated accordingly.

One attack of chorea predisposes to another. This should prompt the physician to take measures to prevent a relapse, particularly in the spring and summer, when the majority of cases occur. Atten-

tion to the general nutrition, proper use of gymnastics and massage, interdiction of excessive mental application, and intelligent mental and physical discipline will go far toward placing the patient beyond the danger of relapse.

A severe form of Sydenham's chorea occasionally occurs with *pregnancy*. It demands active and vigorous treatment from the start, otherwise it will result in such a condition of bodily weakness that the patient will either abort spontaneously or the necessity of terminating pregnancy will become paramount. In these cases there is no difficulty in putting the patient to bed as there is so often in the case of young children, and this as well as the arsenic plan of treatment should be thoroughly carried out. If the severity of the symptoms is mitigated promptly the patient may be allowed to go about, and the prospects are that complete recovery will soon follow. If the symptoms are so severe that the life of the patient is in jeopardy there should be no hesitation in removing the contents of the uterus.

Chorea of *adult males* occurring for the first time is an extremely rare condition, and does not call for specific mention in regard to its therapy.

The subacute type of Sydenham's chorea frequently requires a plan of treatment not unlike the rest cure so often beneficial in cases of neurasthenia the result of overwork. In fact, the rest cure, or a modification of it to which is added the use of arsenic, is the treatment advised. Bromide and chloral have no place in the therapy of the disease other than to combat symptoms, and are never to be given for any length of time. Iron, arsenic, zinc, antipyrin may be given internally, and various forms of electrical and hydriatric treatment externally; but permanent amelioration, even, cannot be promised from any one of them. Sometimes the actual cautery to the back of the neck and vertebral column has seemed very serviceable. This form of chorea should not be confounded with chronic degenerative chorea: the former is an eminently curable condition, while the latter always goes on to mental decay and eventually to physical dissolution.

The infectious disease which Dubini described in 1846 under the name of chorea electrica, and which is now usually referred to by his name, is confined almost exclusively to northern Italy, and is a very fatal disease, at least 90 per cent. of cases terminating in death. No treatment has yet been suggested that diminishes that frightful mortality.

The disease known as Bergeron's chorea, also sometimes associated with the name of Henoch, occurs in nervous anæmic patients of neuropathic heritage. It is sometimes apparently attributable to fright and other emotional disturbance. It is more properly considered as

a manifestation of the tic neurosis. It develops quickly and abruptly; the choreiform movements are bizarre, implicating the muscles of the face, neck, and shoulders by preference, and are often accompanied by symptoms referable to the stomach, indicative of distention and of rhythmical movements in its walls. The symptoms cease during sleep. The most satisfactory treatment is the administration of an emetic and the adopting of other measures to assist the stomach to properly functionate, and of general tonic measures to facilitate the return of perfect nutrition.

Huntingdon's chorea, a degenerative disease of the entire nervous system, of a family nature, characterized by symptoms of mental and physical irritability, followed by physical exhaustion and mental decay, is neither prevented nor benefited by treatment. The mental defects which its victims develop demand hospitalization.

THE TIC NEUROSIS.

THE name *tic* is applied to an abrupt, lightning-like contraction of individual muscles or groups of muscles which act together to fulfil some physiological purpose, reproducing in an exaggerated form some physiological act. Any such movement, it matters not how slight or how extensive it be, varying from the slightest blinking movement of the eyelids up to the most complex co-ordinated movements associated with obsession and apparent manifestation of psychical activity, may be considered a tic. Tic is a special form of myoclonus, and clinically it is comparable to other forms of myoclonus such as paramyoclonus multiplex and chorea electrica, although genetically these diseases may be different. They are properly considered as the expression of a degenerative neurosis, and the tendency to their occurrence is often clearly inherited.

The simplest forms of tics, whether of the face or the extremities, are so closely imitative of some purposeful movement, such as blinking, sniffing, hemming, and shrugging, that they are frequently referred to as habit choreas or habit twitching. Such a reference may be of some service to indicate that they develop occasionally after long-continued purposive or imitative repetition, but if the use of such a term carries with it an expression of opinion that this is their only cause it is to be deprecated.

All tics may be classified primarily into (1) senile (acquired) tic, and (2) early tic, the last being further divided into two varieties, viz. (*a*) degenerative and (*b*) acquired. The senile variety is almost invariably due to or accompanied by degeneration of the blood-

vessels—arterio-capillary fibrosis. Early tic, degenerative or acquired, may be divided into two groups:

(1) Motor tic, which may be further divided into

(*a*) Localized tic, which may include simple twitching movements of the various parts of the face, such as the eyelids, the side of the face, the ala of the nose and the corner of the mouth, spasmodic wry neck, twitching of an individual muscle or group of muscles of an extremity; and twitching, spasmodic movement of the diaphragm, which forms a variety of what is sometimes described as respiratory spasm.

(*b*) Generalized Tic.—These tics include not only the cases of electric chorea that I have referred to, but also those cases in which the tic is more or less universal in its distribution and the movements are not co-ordinated.

(2) Psycho-motor tic, of which there are to be distinguished two distinct types: first, one in which the movement is the motor response to some distinctly formulated idea or thought, usually called an obsession; and, second, a complex co-ordinated tic (*tic co-ordiné* of Gilles de la Tourette), a more or less generalized tic frequently coupled with the production of definitely articulated sounds and words or rapid repetition of words, recurring utterances which are expressive of the feelings or emotions and not of cognitions or thoughts. When these sounds assume the form of recurring utterances they are called echolalia; when they are filthy and obscene, as they often are, they are termed coprolalia. Varieties of this affection have been described in different parts of the world under different names: in the Orient as *latah*, in Russia and Siberia as *myriatchit*, in Canada and Vermont as "the jumpers," and in general as "saltatoric spasm." *Tic convulsif* is apparently becoming the universal designation. Motor tic may be further classified topographically. Thus, we have (*a*) fronto-orbicular tic; (*b*) nasal and naso-orbicular tic; (*c*) facial tic; (*d*) nuchal tic, sometimes called spasmodic torticollis; (*e*) tic of the diaphragm, often called respiratory tic; (*f*) bowing tic, or *tic de salaam;* and (*g*) string-halt tic.

Treatment.

The treatment of the neurosis of which the tic, its various manifestations and psychical equivalents are an outward expression is one of the most unsatisfactory tasks that the physician can set himself. The treatment of all the degenerative neuroses requires great therapeutic tact and fertility of resource, but this one above all others calls for their possession in a high degree.

Simple Tics, or Localized Spasms.—*Blepharospasm, Trismus, and Facial Spasm.*—The simple tics of the face are never painful,

and are annoying largely from an æsthetic point of view. They can often be combated if the treatment is begun early and adhered to. In every case of blinking and twitching of the frontalis and corrugator supercilii the refractive state of the eyes should be carefully inquired into, and if defects are found they should be corrected. The nasopharynx should also be thoroughly examined, for in not a small number some abnormality of this passage is found. If the patient be a child, it should be removed from school for a time and encouraged to voluntarily restrain the movements. In some cases partial isolation is of service. As a general rule, however, the best results will be obtained by making the patient lead a rollicking out-door life while at the same time a course of tonics and iron is administered, and those who come in contact with the sufferer are instructed to take no notice of the movements. Intimidation, recommended by Trousseau, should never be employed. In some instances instillation of cocaine into the eye and the internal administration of belladonna may be serviceable for the temporary relief of the condition, and will make an impression upon the patient.

Convulsive twitchings of the muscles of the face occur more frequently in mature and late adult life, and to treat them satisfactorily one must make a diligent search for the cause and remove it if possible. In some instances twitching in the musculature of the seventh nerve is reflexly produced by irritation of some branch of the great sensory nerve of the upper part of the body, the fifth, and in every case an examination for such a source should be made. The organs of special sense, the teeth, and the condition of the nerve itself should be passed in review. Individual patients will recognize that the tic is aggravated by certain mental and physical conditions, which they soon learn to avoid, and of which the physician should take cognizance.

The general health of many patients who have facial spasm is frequently impaired, and oftentimes measures directed to increase of nutrition and physical strength will materially improve the patient. In some cases occurring in late adult life evidences of arterial degeneration are to be detected. In cases of this sort treatment must be directed wholly to overcoming the morbid state of the bloodvessels. Almost every drug and measure that has ever been reputed to have any antispasmodic virtue has been tried for the relief of this annoying trouble, but there is very little encouragement for the selection of any one of them over all the others. The hypodermic use of morphine will relieve the twitching temporarily, and it has been recommended that the patient should be kept under the influence of the drug thus administered for a prolonged time. There is danger in such procedure, and the patient

can never be promised that the cessation, which it rarely ever fails to cause, will be a permanent one. The danger of contracting the habit is enormous, and the disease is infinitely to be preferred to the latter. Injections of strychnine in moderately large doses directly into the seat of the twitching I have often found serviceable. I have never seen any benefit from conium, which is frequently useful when given in large doses in spasmodic torticollis, nor from gelsemium. The most serviceable nervine or combination would seem to be a combination of arsenic and belladonna given in doses sufficient to produce slight physiological effect and kept up for a long time.

Electricity in the shape of the galvanic current (the negative pole at the back of the neck, the positive pole immediately in front of the ear, and a current of two or three milliampères allowed to pass for from ten to fifteen minutes) occasionally lessens the severity of the twitching while its administration is kept up; permanent benefit is not often attained from this, but it may be used as an adjuvant to other measures.

Stretching the facial nerve has been done many times. Nothing short of a surgical operation and thorough stretching is of the slightest effect, and even then the results of the procedure are not encouraging—the spasm almost always recurs after a variable time. Occasionally, when the tic is very severe and no amelioration can be got from other measures, this procedure should be resorted to, and active treatment be kept up afterward even though the twitching has entirely ceased.

Occasionally, temporary relief is obtained by a small blister behind the ear, by pressure on one of the larger branches of the facial nerve where it comes to the surface on the face, and by the application of the actual cautery to the back of the neck, but the most satisfactory results can be expected from persistent effort directed to improvement of the general tone and nutrition and the symptomatic administration of nerve-sedatives.

In several cases of facial tic associated with *nuchal tic*, spasmodic rotatory and lateral *torticollis*, I have seen prompt amelioration follow suspension of the patient from the head by means of the head-piece of the apparatus constructed to suspend tabic patients, and practically the same as that used by the surgeon in applying the plaster corset-splint.

Suspension is oftentimes an important alleviating measure in the treatment of idiopathic torticollis, it matters not in what direction the movement be, whether lateral, backward, or rotatory. Associated with the hypodermic administration of atropine in large doses or of fluid extract of conium by the mouth, sixty drops in twenty-four hours, it often secures complete relief. Naturally such conditions are

liable to relapse, and this should be guarded against by the administration of arsenic, quinine, and iron, and the symptomatic use, if necessary, of hyoscyamine, gelsemium, chloral, and bromide. About the same chance of relief is to be expected from the use of the galvanic current in this disease as in facial tic. It is never more than an adjuvant. Massage, however, is often of real service. In some cases its efficacy seems to be enhanced by giving it while a stream of hot water is flowing over the part—douche-massage. In extreme cases resection of the spinal accessory nerve and of the posterior branches of the upper four cervical nerves has been resorted to with fairly good results, but partial section of the sterno-cleido-mastoid muscle is to be preferred if surgical measures are necessary.

The general treatment of *tic of the legs*, the so-called "spring-halt tic," does not differ from that of any of the other simple tics. On account of the facility with which the cold pack can be applied to the extremities, and the soothing effect which it oftentimes has, the local treatment can be carried out with better chances of relief. This is the most efficacious hydriatric procedure for this condition, but sometimes a warm douche against the parts, without considerable pressure, say from eight to ten pounds to the square inch, and kept up for a long time, will be of service. In other instances the Scotch douche is far more efficacious.

Spasm of the respiratory muscles and *tic of the diaphragm*, which are most commonly associated with the production of a loud explosive sound—such as "heim" and hiccough—repeated from ten to thirty times a minute or oftener, are happily not frequent. Two cases that have been under my care during the last few years have proved entirely unamenable to every form of treatment. In one of the cases where the sound was so loud that it could be heard all through the house, the patient was kept under the profound influence of opium for several weeks without the slightest benefit. She was then isolated and put on a tonic plan of treatment; this not being followed by any results, gradually increasing doses of dilute hydrocyanic acid, and afterward hyoscine, were given, and so on until every conceivable therapeutic measure was tried, without the slightest benefit. All treatment was then given up, the patient was studiously neglected and sent into the country, but the results were always the same. After nearly three years' duration the attacks suddenly ceased while the patient was taking large doses of copper. The second patient, in whom the tic took the form of convulsive hawking and spitting, died from exhaustion, her symptoms having stubbornly resisted all medication.

Convulsive Tics; Co-ordinated Tics.—Treatment of psychomotor tics should be directed particularly to the development and

maintenance of mental equilibrium. This cannot be attained by the utilization of any one measure; the various therapeutic procedures —such as hydriatric measures, exercise, occupation, change of surroundings—must be combined with disciplinary measures of isolation, regularity, and obedience. In the simpler forms of the disease, such as rolling upward movement of the eyes in rapid succession, or quick successive tappings of the toes or the fingers, or quickly repeated movements of the head toward one side, all in response to some formulated idea, I have been successful in some cases by the utilization of these measures and at the same time the employment of suggestion. In one case I first suggested to a patient who had compulsory movements of looking toward the horizon to substitute for these a movement of pressing the toes against the sole of the boot. After this was accomplished I suggested that he should have the mental accompaniment of such a movement without the actual muscular contraction. After he became convinced that this was possible it was easy to dispel them altogether.

The severer forms of psycho-motor tic are usually incurable and we must be content to secure amelioration. Some benefit may at times be derived for almost any one measure, such as hydrotherapy, central galvanization, rest in bed, isolation, etc., but the greatest benefit is to be expected when these are combined and when they are accompanied with intelligent disciplinary measures directed immediately to the mental sphere.

In some cases of generalized tic in which the convulsive movements are neither co-ordinated nor accompanied by psycho-motor explosions, much benefit is to be derived from careful persistent treatment, medicinal and gymnastic. In some of these cases it is seen that the convulsive movements do not occur during the performance of some complex purposive acts, and by this I mean acts that have not become so completely involuntary as walking and the like. For such cases regular methodical work in a gymnasium, with persistent practice of exercises requiring careful co-ordination, absorbing occupations such as bicycle riding and learning to dance may be essayed, and sometimes with benefit. In one case of severe generalized tic now under observation I am sure that a patient has derived marked benefit from patient and long-continued trials to learn to ride the bicycle, from indulgence in this form of exercise since then, and from the internal administration of nitrate of silver. The latter drug given in from $\frac{1}{8}$ to $\frac{1}{4}$-grain doses, is, I believe, one of the best alteratives in this neurosis. Its administration should be alternated with salts of gold and of copper, and of the iodide of potassium.

PARAMYOCLONUS MULTIPLEX.

PARAMYOCLONUS MULTIPLEX is the name given to a form of myoclony which was first described by Paget in 1847, as a form of chorea electrica, but which is associated now with the name of Friedreich, he having described it anew and with great detail in 1881. Paramyoclonus multiplex occurs usually in adult life, most often in those of neuropathic inheritancy, and is characterized by the occurrence of abrupt, involuntary contractions similar to those produced by an electric shock; these may be somewhat localized in their manifestations, but never systematized or rhythmical, and they are repeated at variable intervals. The myoclonus is the striking symptom, but it is not the only one, for it is almost invariably accompanied with symptoms of a mild form of melancholia, neurasthenia, or hysteria.

The disease is of uncommon occurrence in this country.

TREATMENT.

The treatment of paramyoclonus is, first, treatment of the neuropathic state; and second, treatment of the tonic, clonic, or fibrillary contractions by which it is manifested.

It is unnecessary to detail here, even if space warranted it, the methods that may be employed to combat the first. Hydrotherapy and massage have of latter years been extensively used to overcome the functional nervous diseases. Paramyoclonus multiplex is one of the diseases in which neither baths nor the douches seem to have any beneficial effect. The most important measures in the treatment of the general condition are those taken to maintain bodily nutrition and strength, and those to circumvent mental introspection and depression. A methodical tonic, hygienic course of treatment will fulfil the first requisites, but the latter is not so easy. The very nature of the disease and its chronicity prevent travel, sports, amusements, and the relaxation to be obtained from them, and often institution-treatment such as is offered by a sanitorium is advisable.

Of the measures that can be taken to relieve the severity and frequency of the material manifestations, the first place is held by electricity and the second by hyoscyamus, neither of which, however, is specifically curative. When cure results in these cases, it is from the combined effect of general hygienic, dietetic, and tonic measures, associated with active treatment by the physician.

Electricity is best applied by means of central galvanization, one electrode being placed over the spine and the other on successive parts of the member in which the clonus is manifest; generally the upper or lower extremities are involved, although the face may be affected.

Often striking amelioration is the result of careful, persistent electrical treatment.

Hyoscyamus may be given internally or hypodermically in the form of hyoscine hydrochlorate; its use should not be kept up for any considerable time, as the effects of it are demoralizing to general nutrition. Any form of hypodermic medication is to be avoided in patients ill with functional nervous disease; and this disease furnishes no exception to the rule.

On account of their proven efficaciousness in Sydenham's chorea, arsenic, quinine, and antipyrin have frequently been recommended. Their administration may sometimes be indicated to fulfil particular purposes, but, all in all, they have no place in therapy of the disease other than as symptom-medicines.

Drugs that are of repute in the treatment of hysterical affections, such as the valerianates, zinc salts, etc. do not seem to have the slightest influence on the course of this disease. The subcutaneous administration of atropine and cocaine is mentioned only to be condemned.

In a general way it may be said that the great majority of sufferers from paramyoclonus multiplex will either completely recover under the plan spoken of, or that the severity of the symptoms will be so mitigated as to permit of their being comparatively comfortable.

EPILEPSY.

Before discussing the treatment of epilepsy it is necessary to be explicit about the forms of this neurosis. Epilepsy has been variously classified according to its supposed anatomical origin, its etiology, the time of life at which it appears, its symptomatology, its purity, and its complexity. Clinically, epilepsy is divided into *petit mal*, *haut mal*, psychical epilepsy and epilepsy procursiva, periodical sleep-seizures of an epileptic nature, etc. Such a classification is of service to illustrate types of the disease, but it is of no aid in determining a plan of treatment. The neurosis epilepsy, it matters not what clinical form it assumes, predicates, if I may be allowed to project the theory, a similar diseased condition in all cases, it matters not what the outward form or manifestation of the disease may be, and requires practically the same treatment. The division of epilepsy into organic and functional is a convenience, for the former term indicates that some gross lesion is the organic basis of the symptom epilepsy.

In discussing the treatment of epilepsy I shall describe, first, the form of epilepsy that occurs before the age of maturity, generally manifesting itself before the time of puberty, without direct causation except what may be attributed to heredity, to consanguinity, parental vice, and to some non-sufficient exciting cause, such as fright, great anxiety, and excessive mental application. This is the kind of epilepsy to which the name idiopathic, or true, epilepsy has been given, in lieu of a more accurate term to indicate its causation. It is also referred to as hereditary epilepsy, primary epilepsy, congenital epilepsy. Just what proportion of all epilepsies this form constitutes it is difficult to say, but probably about 80 per cent. It does not include any considerable proportion of the epilepsies that develop after the period of maturity.

In the vast majority of cases that develop after maturity epilepsy is a symptom of some organic disease of the brain or of some toxic condition. This variety is also often spoken of as cortical epilepsy. It is often due to encephalitic conditions, injuries, and cerebral infantile palsies. The epilepsy that is termed organic is known, when the organic processes are limited and focal, as Jacksonian, or focal, epilepsy, and when the organic process is not focal or localized as general cortical epilepsy. It should be kept in mind, however, that the term Jacksonian, as generally used, does not apply to the process, but to the clinical manifestation.

Jacksonian Epilepsy.—The focal organic epilepsies occur most frequently in adult life, except when they are the expression of new growths, post-meningeal cicatrices, meningeal and cortical hæmorrhages, and other accidental conditions which may occur at any time after birth. In adult life this form of epilepsy is most frequently the expression of traumatism to the skull, setting up localized pathological changes in the bone, meninges, and brain, gummatous meningitis of the convexities, leptomeningitis, endarteritis, localized gummatous formations, or all or some of these lesions combined, constituting cerebral syphilis. Naturally, the same factors that have been mentioned as causative of organic epilepsy in the child may be operative in the adult and result in similar conditions, and will be manifest by symptoms of the same type and form.

Reflex Epilepsies.—Epilepsies that are symptomatic of some central or reflex irritation are not common. Such epilepsy may result from irritation of areas of the brain which are not considered strictly motor, from hydrocephalus, from toxæmic conditions such as uræmia, diabetes, and absinthe. On the other hand, a similar epilepsy may be the result of peripheral irritation, particularly irritation of some special sense organ or a part highly endowed with tactile sensibility, such as the sexual organs. I believe that this brief state-

ment represents all that need be said of so-called peripheral epilepsy, but, for fear of misconstruction, I desire to say that the epileptic manifestation which may follow continued irritation of some peripheral sense-organ is in no way a disease comparable to primary, to congenital, or organic epilepsy, or even to a toxic epilepsy. As I construe it, the epileptic attack or attacks which result from peripheral irritation are probably a clinical manifestation of a genuine neurosis, or of a general neurotic condition, which, however, might not display itself by convulsive phenomena if the peripheral irritations did not exist.

The reflex epilepsies should not be considered in too great detail, even to deny their more than rare occurrence compared with the entire number of epilepsies in which no cause can be discovered. Their consideration by enthusiasts and "faddists" has already done immeasurable harm, and the past history and literature of reflex epilepsies, as well as the makers of such histories, deserve to be speedily forgotten. No honest, properly trained physician ever fails to completely examine a patient, and, if he discovers a condition of the foreskin that interferes with its proper function, he removes it just as he would remove a thorn from a man's foot if he found that it interfered with his walking. But this does not prompt him to tell the profession of his success in curing people who are unable to walk, nor does he desire to be considered an orthopædic surgeon. No more should a physician who amputates a foreskin or releases an adherent clitoris and so destroys a source of peripheral and central annoyance, claim to be the discoverer and possessor of a new and epoch-making method of treating epilepsy. In my opinion, the most dangerous specialist in the treatment of epilepsy to-day is he who claims to cure his patient by partial, complete, multiple or repeated tenotomies of the eye-muscles. Before going further, I hasten to disclaim any prejudice either against the men who have made or are making such claims, or their methods; but it does not seem to me that a person who has examined into this matter carefully can be led to any other conclusion.

There is some slight evidence that patients afflicted with epilepsy are also the possessors of refractive anomalies more frequently than are their fellow-beings who are not epileptic, but the truth is that such ocular imperfections are but one of the somatic stigmata of degeneration and should be classified with the prehensile finger, the bullet-shaped head, the Darwinian tubercle, the Lamarckian hypophysis, the torus palatinus, and the many other defects which statistics prove beyond cavil are the natural possessions of the epileptic. I believe, further, that such muscular insufficiencies and refractive shortcomings should be corrected in epileptics the same as they should be in those who are not epileptics.

General Treatment of Epilepsy.

Attention to the philosophy of the treatment of epilepsy is no inconsiderable aid to the proper application of medicinal agents, and to it I shall revert later.

The therapeusis of epilepsy varies according to the form of epilepsy. The plan of treatment that is applicable to primary, so-called idiopathic, congenital epilepsy is not the proper treatment for syphilitic, traumatic, or accidental epilepsy; nor is treatment of either of these appropriate for the epilepsy which is dependent upon purely degenerative processes, such as parasyphilitic and post-cicatricial degenerations.

The treatment of epilepsy should be subdivided into first, the moral and hygienic treatment, which includes the diet, the discipline, the education of the patient, and all that these imply, such as the relation of the epileptic to society; and, secondly, the medicinal treatment, which should include not only the drugs employed, but the time of administration, mode of administration—*i. e.*, the vehicle, the uniformity of the solution used, and the measures taken to offset disagreeable effects of treatment.

Experience has taught me, and I am sure it has taught others who have had a considerable experience with this disease, that the reason why physicians fail so often to effect such pronounced amelioration, not to say cure, of the disease as to satisfy patients and their families, is because they neglect almost entirely the moral and hygienic treatment, and depend for their success on the administration of medicines alone. The result is failure. I am sure I echo the sentiments of many practitioners when I say that they dread the visits of an epileptic patient after they have had several trials at attempting to cure him.

Moral and Hygienic Treatment.—The *moral treatment*—by which I hope I shall not be understood as implying only application of the canons of ethics, for I use the term in its broadest sense—is particularly adapted to the primary congenital variety. This kind of epilepsy occurs most commonly at an age when the disciplinary measures are most efficacious. Habits of obedience, of the restraint of passions and appetites, of emotional equanimity, of temperate mental activity and industrious application should be instilled. The education of these unfortunate beings should not be neglected; on the contrary, it should be assiduously cultivated. The education should not alone be of the mind, but of the senses, and particularly of the hands. Many epileptics, if properly trained, become artisans, masters of handicraft, and laborers sufficiently skilful to earn a livelihood and frequently to compete with their non-handi-

capped fellow men. Modern methods for the education of backward children, teaching mainly by the aid of environment, are the best means to this end. Hand in hand with this must go the education of the hands. If an epileptic child manifests any special predilection or ability for certain occupations, providing such do not involve excitement and strain, such inclination should be fostered, while at the same time the bodily and mental life are cared for. Such details may seem pedantic, but the utter hopelessness of these cases, if they are allowed to go on without other and more intelligent surveillance than that of the ordinary parent, warrants them. The enthusiastic pedagogue and the intelligent physician must work together to make the best possible citizen out of the epileptic child. Institution-treatment, where all these forms of moral, mental, and physical development can be carried out, is ideal. Already considerable progress has been made in this country in the establishment of State institutions for the care and treatment of epileptics. Every physician should lend the weight of his voice and his pen to advance public sentiment in this direction until such time when dependent epileptics are as well and adequately cared for by the Commonwealth as are their brother defectives, the insane and the idiotic. After the establishment of such institutions parents should be compelled to send their epileptic children to them unless they can be properly cared for and educated at home. The necessity of beginning the education and treatment of an epileptic before the disease has continued for a certain length of time, before what may be conveniently called the "epileptic habit" has developed, needs no emphasis.

The *hygienic treatment* of epilepsy is embraced in the regulation of the mode of life of these patients, their habits, indulgences, diet, exercise, movements, occupation, and the assumption and discharge of social and political functions and obligations. Climatic conditions do not seem to enter into the treatment of epilepsy.

The mode of life of an epileptic patient should be one that allows him to be free from care, untrammelled by any considerable responsibility, and one that is conducive to mental equanimity. The contraction of all habits, unless that of uniform occupation be considered a habit, is to be deprecated. Tobacco, alcohol, and other unnecessary luxuries which may easily be made injurious, are to be absolutely interdicted. Although it is impossible and frequently impolitic for a physician to interfere in any way with the development of the normal passions, such as love, marriage for the congenital epileptic is to be severely frowned at. The contracting parties should be fully apprised of the nature and probable outcome of the disease and its hereditability. Any form of exercise that is not attended with great physical effort, or that will not jeopardize the patient's life or limb

if an attack of epilepsy should occur while he is participating in it, is to be allowed and recommended. Of the sports, golf is the ideal one, although I have more than a few epileptics who engage in bicycling and other popular and pleasurable forms of exercise. It is a fact well known to every physician that unusual care must be taken to keep the physical condition of an epileptic up to that of an ordinary person who does not take any exercise or gymnastic drill for its maintenance.

What has been said of exercise applies also to amusements. There are very few amusements that an epileptic should be prevented from enjoying. Theatre-going in moderation, especially in the afternoon, social intercourse if the mental state of the patient allows it, parlor games, and the like, all help to vary the monotony of existence. The assumption and discharge of social functions by epileptic individuals will vary with each individual and will have to be decided by the physician according to the development of the patient.

In a word, it may be said that if a person who has epilepsy is capable of discharging social or political duties, none except that of marriage should be advised against, providing such duties do not interfere with the regularity and methodical arrangement of his life. The nature of the disease requires that for its treatment large quantities of a medicine which acts as a powerful depressant be taken for a long time. In order to overcome the peccant effects of this substance, Nature's best restorer, sleep, should be obtained in liberal amounts.

Diet in Epilepsy.—More important than all, perhaps, and very much more important than any one thing, is the question of diet. Like other functions of the body in epileptics, that of alimentation is frequently impaired, and this combined with defective inhibition and restraint of the appetite, frequently results in the most disastrous dietetic consequences. At one time it went abroad, and even met with acceptance in some quarters, that nitrogenous substances such as meat should not be consumed by people suffering from epilepsy, or, if so, then in the greatest moderation; and those who recommended such a plan were often able to fortify their claims by statistics which showed that the number of epileptic attacks in an individual who was not allowed to eat meat was considerably less than when he so gratified his appetite. The *post hoc propter hoc* of this argument is, however, a most fallacious one: cutting off the animal food very frequently gives the over-burdened digestive tract an opportunity to rest and causes a partial cessation of the accumulation of the products of incomplete digestion which, on being absorbed into the system, exercise a pernicious effect upon the highest nerve-centres; and thus apparent benefit for a time seems to result from eliminating them from the dietary. Far greater benefit,

however, is secured when the entire dietary is subjected to the physician's scrutiny. Epileptic patients should be given a mixed diet, in which, however, fats, green vegetables, fresh and cooked fruit predominate. Particular attention should be given to the preparation of food. Fermentable substances of diet, such as starches and sugars, substances difficult of digestion and which, when digested, contribute but little to alimentation, tea, coffee, etc., are to be avoided. Care should be taken that the patient eats neither too much nor too fast. If all other treatment of epilepsy than that directed to the regulation of the alimentary canal and the maintenance of a normal digestion with a high state of nutrition were omitted, it is probable that more benefit then would follow than from the administration of the best medicinal anti-epileptic measures alone while dietetic errors were rampant.

Medicinal Treatment.

In speaking of the medicinal treatment of epilepsy I shall keep in mind a typical case of primary or congenital epilepsy, for this is the form in which medicinal treatment is attended with any considerable success. As I have said before, I believe that the reason why so many cases of epilepsy under the care of the general practitioner are not greatly benefited for all time by treatment is that although the prescribing of drugs may be unimpeachable, yet proper attention to the mode of administration, intelligent persistency, and careful attention to the details hereinbefore mentioned are not combined with such exhibition of medicine.

The Salts of Bromine.—*Their Utility.*—The one great measure in the treatment of epilepsy is the *salts of bromine.* If all other drugs which have a reputation as anti-epileptic remedies were lost to the profession, the results of treatment by this measure alone would be as good as they are to-day.

It does not seem to me that the selection of any particular salt of bromine is of such importance as to merit considerable discussion. By some, perhaps by the majority, bromide of potassium is considered the equal if not the superior of any of the other bromine salts. On the other hand, many prefer the bromide of sodium, not alone because it is more agreeable to take, but also because it is less apt to derange the stomach and because of its greater percentage of bromine. Bromide of strontium has been very successful in the hands of some practitioners; but I can in no way agree with those who make claim of special efficacy for this salt in the treatment of epilepsy. As a matter of fact, it is best to begin the treatment of epilepsy with either the bromide of sodium or the bromide of potassium, and if these are not well tolerated or as efficacious as they should be, another salt

of bromine or a combination should be tried. I have never been able to satisfy myself that a mixture of the bromides possesses any particular advantage over the individual salts, although in some cases the drug is not so apt to derange digestion if given in combination and with an acid such as:

℞ Acid. hydrobrom. dil.,		♏ x.
Ferri bromidi,		gr. j.
Potassii bromidi,		gr. x.
Sodii salicylat.,		gr. ij.
Spts. rectificat.,		
Glycerol. pepsin.,	*āā*	♏ x.
Ol. gaultheriæ,		♏ ss.
Liq. ammon. citræ (B. P.),		ʒss.

One dose. This may be doubled or tripled.

Physiological and Toxic Effects of the Bromides.—In order to administer bromides successfully, the physiological action and the toxic effects of the drug should be well in mind. It is not important, perhaps, to consider here either of these, except incidentally. Such information can be obtained in any text-book on therapeutics. The common acute toxic manifestations of the drug are the eruption of acne; occasionally the production of very striking trophic changes going on to ulceration; bromine-inebriety, characterized by vasomotor inhibition, which may extend to very considerable vasomotor paresis with all its symptoms, such as cold extremities, clammy skin, slightly depressed bodily temperature and a lowering of the vital capacities; coated tongue; foul breath; loss of the palatal and pharyngeal reflex; stomachic catarrh; depression of sexual vigor; an unsteady gait, amyosthenia, particularly manifest in the legs; forgetfulness, variable degree of aphasia, manifest by the misuse of words and terms, and ordinarily called paraphasia; slowness of mental response, inability to co-ordinate the complex of mental processes, and often a considerable degree of dementia. In acute bromine-poisoning the symptoms may develop so rapidly and be of such severity that they simulate intracranial trouble, such as brain tumor.

The severe manifestations of bromism can be counteracted by the administration of restorative, cardiac, and vasomotor tonics, by drugs that have a special beneficial influence upon the skin, and by various hydriatric procedures with which every physician should be familiar. Very frequently a daily dosage of what would otherwise be toxic can by the utilization of these measures be administered without deleterious or disastrous results. The necessity for the continued use of the bromides to combat the frequency of epileptic attacks and

also after the fits have ceased is conceded by every one. The intermittent administration of large quantities of bromides is to be deprecated. Nothing can be gained by interrupting the administration of the drug.

Mode of Administering the Bromides.—This medicine can be administered to best advantage if some definite solution of the salt, such as 25 or 50 per cent. watery solution, be used as a standard. It is impossible to say in grains what the dose of the bromide salt shall be. There is no more a "dosage" according to weights and measures than there is of alcohol for a patient with typhoid fever. The dose is the amount the patient can dispose of. For one patient it may be a scruple, for another a drachm: it is necessary to make an individual study of each case. It is as ridiculous to say that the dose of bromide for an epileptic is a scruple four times a day as to say that the dose of morphine in peritonitis is one-fourth of a grain every four hours. No rational person would think of giving the latter directions, and no person who has had anything to do with the treatment of epilepsy would think of giving such instructions. The drugs must be given up to the point of tolerance, up to the completeness of its physiological action, and the patient kept on this if it controls the attacks; if not, toxic effects no severer than absolutely necessary must be produced, and at the same time measures must be taken to prevent toxic manifestations from becoming dominant. After the details have been arranged to the physician's satisfaction, he should study a chart made with the end in view of showing the frequency and time of the attacks; that is, whether they are matitudinal, nocturnal, or periodic, and whether they have any relationship to the occurrence of physiological function, such as menstruation, whether they are of a petit mal or haut mal character, and whether they are preceded by an aura. If the attacks are always matutinal, the large dose of bromide should be given before the patient arises, and a similar plan should be pursued if the attacks are commonly nocturnal. In those cases in which there seems to be no definite time for the occurrence of the attacks and in patients who are occupied during the day, it is my custom to administer a small dose of bromide in the morning, another during the afternoon, and a comparatively large dose at night. This plan has the advantage that it facilitates sleep, while not producing sufficient stupor to interfere with the patient's waking-time. If, even with this plan of administration of the bromides, satisfactory results do not follow, they should be withdrawn and some other anti-epileptic remedy substituted. I desire to repeat that the desultory and irrational administration of this medicament is worse than no bromide at all. Natural states such as pregnancy are not at all affected by the administration of bromine,

nor is the fœtus; and during such states especial care should be taken to prevent the occurrence of attacks.

Seguin has pointed out the advantage to be obtained if the salt is given well diluted and in some alkaline water such as Vichy, and for poor patients water made slightly alkaline by the addition of bicarbonate of sodium. The more liberally the dose of bromide is diluted the better will be its effect.

Abuse of Bromide.—In this connection one word may profitably be devoted to the abuse of bromide. I know of no other drug—with the exception of those that produce habits, such as morphine and cocaine—that is so enormously outraged as the salts of bromine are. If the truth be told, their therapeutic application is very limited, and the disease under consideration, and possibly also migraine, is the only one that justifies their continuous, persistent administration in large doses. The plan which is so frequently pursued of prescribing bromide as a sort of pick-me-up merits the same condemnatory language as that used by temperance advocates against the prescribing of alcohol. It is only necessary to see the colossal mental and physical depravity that sometimes results from the ignorant administration of this drug in minor ailments, and sometimes even in epilepsy, to fully appreciate the truth of this statement.

The most important measure to overcome the severe acne which often attends the administration of the bromides, aside from the maintenance and improvement of nutrition and attention to the hygiene of the skin, is some preparation of arsenic, preferably arsenate of sodium; unlike Fowler's solution, this preparation rarely deranges the digestion. It should be given in moderately large doses and continued for a short time, one or two weeks, and then intermitted.

If the symptoms of *chronic bromism* become dominant, the patient being pale, with dry, crisp-looking mucous membranes; stuporous; forgetful; slow of breath and of heart; depressed; suicidal and emaciated, I have found opium a better stimulant than any other. It would seem to prevent the neural protoplasm from wearing itself out in futile endeavors to overcome the rapid waste of the body and to stay the latter till rest and nutrition can pick them up. The best all-round vasomotor tonic, stomachic, and general restorative is nux vomica or its alkaloid strychnine, which is advantageously administered combined with dilute hydrochloric acid. When the toxic effects of the bromide are manifest by inhibition of sexual vigor and of the vesical sphincter, belladonna and hyoscyamus are often of considerable service to alleviate these conditions. Belladonna has in its favor that it of itself is considered no mean anti-epileptic. The most potent aid in the hands of the physician to prevent bromism and its terrible consequences is hydrotherapy. A patient who loses

weight and becomes anæmic, who is depressed mentally and physically, is often started in the opposite direction if instructed to take a tepid or slightly cold plunge-bath in the morning, followed by a vigorous towelling, or a spray-bath and blanket pack.

If it is possible, these patients should now and then take a course of treatment is some hydriatric institute, which are now found in nearly every city of any considerable size. They may be substituted, however, to no mean advantage, by the ordinary hose-pipe if sufficient pressure can be obtained, and by the bath-tub and sponge. Caution should be used in prescribing the cold plunge or cold shower for these patients. Impaired vitality due to the administration of the bromide often prevents them from properly reacting. If for any reason it becomes advisable to materially diminish the dose of bromide which the physician has determined is sufficient to hold the attacks of epilepsy in abeyance, I consider that the plan which is safest above all others is that of putting the patient to bed and keeping him there until the usual dose of bromide can be administered ;—so far superior to all others that I urge its employment in every instance in which it is possible.

The most important adjuvant to the use of bromides, in the writer's opinion, is opium. The value of opium in some cases of epilepsy has long been common knowledge, but it was reserved for Flechsig to point out, as he did a few years ago, that opium administered for a short time in enormous doses, then stopped and followed by large doses of bromides, seemed to possess special value. I have given this plan of treatment an extended trial and am an advocate of it in certain cases of idiopathic epilepsy which have become very chronic and in cases occurring in early life associated with such somatic and mental shortcomings that defect of the brain is indicated. The plan is to administer ordinary pulveris opii or its equivalent of the extract up to 6 or 8 grains daily, the maximum quantity being reached as soon after the beginning of the administration as possible. The patient is kept on this maximum dose for six weeks ; at the end of that time the opium is stopped abruptly and bromide of potassium or sodium to the quantity of 2 drachms daily is given. After a few weeks, varying according to the evidences of bromism produced, the quantity is reduced one-half, and later this may be diminished to 30 or 40 grains, and in some cases even less than this, in twenty-four hours. In my experience the attacks of epilepsy can be materially reduced in this way in almost every case that has shown itself obstinate to the ordinary bromide plan. After a year or two, if the attacks are not kept in abeyance, the opium may be repeated. I have yet to see any detrimental results or sequences of employing this method.

The mixture of equal parts of chloral and bromide, which is advocated by Seguin in certain cases, has been put to the test of some personal experience. Its field of usefulness, I believe, is more limited than that of the opium-bromide plan. In cases of nocturnal epilepsy such a mixture is often more efficacious than bromide alone.

Of the other drugs that have been persistenly advocated in the treatment of epilepsy by clinicians whose names are synonymous with integrity, borax and belladonna, and perhaps adonis vernalis, are the most important. Personally I have had considerable experience with the use of borax in epilepsy, but I have never been able to convince myself that it has any effect upon the disease at all comparable to the bromides. For cases in which for some reason the latter cannot be administered it is the best substitute. It should be given in powder or solution, from 10 to 30 grains three times a day. The only bad effect of such ministration is an occasional attack of psoriasis which is easily combated by the administration of arsenic. Belladonna and digitalis and more recently adonis vernalis have been recommended in epilepsy, either alone or in combination with the bromides. One is never justified in administering them alone, at least not with the hope of effecting a cure; very frequently, however, they become important aids, not alone to offset some of the disagreeable accompaniments of bromide administration, but to pick up cardio-vascular tone and aid the system in carrying off the bromides. The tincture of these drugs is generally used, the first two in doses of from 5 to 10 drops and double this quantity of the latter. They may be administered with the bromides. With the exception of borax, perhaps, none of them deserves the name of substitute for bromide.

A number of other substances—such as simulo, antipyrin, acetanilide, nitro-glycerin, nitrite of amyl, horse nettle, and antirabic injection—have been undeservedly praised and hailed as cures for epilepsy. Each of these, with the exception of the first named and the last, has a place in the therapeutics of epilepsy, but only to fulfil some certain definite mission, and to be used symptomatically. For instance, in cases in which a distinct vasomotor manifestation precedes an attack in the shape of an aura the administration of nitro-glycerin with the bromide seems to have a particularly beneficial effect, and especially in petit mal attacks.

Measures that have been extensively written of and which I believe are not of the slightest value are hypnotism, hydrastinine, salicylates, duboisine, picrotoxin, cannabis indica, amylene hydrate, osmic acid, sclerotinic acid, and cocculus indicus. It may be difficult to believe that any of these substances has been praised as efficacious, but a review of medical periodicals shows such to be the distressing

truth. None of them deserves a trial. Naturally, the salicylates, beta-naphthol, oil of peppermint, hydrastinine, and cannabis indica may be used symptomatically in epilepsy as they are in many other diseases, but this does not mean that they are true antiseptic agencies.

After briefly referring to the various substances that are used in the treatment of epilepsy it is seen that the one substance to which faith is attached is some salt of bromine. The others that have been mentioned with favor are aids to the bromides or substances that can be made use of when the administration of the former is denied.

Moral Suasion in the Treatment of Epilepsy.—Occasionally we meet patients who are not willing without considerable persuasion, and sometimes even not then, to undergo the bromide plan of treatment, which often involves a considerable suffering and deprivation. To overcome such objection it has only to be shown to them and to their parents in a convincing manner that they are afflicted with a disease which without treatment is progressive, and that to a most ignominious end, the pauper or insane asylum, or to the custody of a care-taker if their worldly circumstances allow. If the hope can be extended to them, as the writer believes it can be, that the plan of treatment which is advocated, although it does not often completely cure the disease, very often so far restores the patient to health and freedom from attacks that he is able to discharge the duties of a good social and political citizen, the attending bromism, the mental deviations, and the other symptoms which the long-continued administration of the salts of bromine sometimes produce are nothing comparable to the misery which the possession of a progressive epilepsy entails.

It has often been remarked that new plans of treatment and change of doctors are as beneficial to epileptic patients as change of air and clime are to other invalids. There is truth in this remark, but it is not difficult of explanation. The new physician inquires more closely into the diet, gives more stringent directions as to mode of life, and starts the administration of medicines on a definite plan, and the results are better for a time than his predecessor was able to get. But a sort of a personal inventory on the part of the first physician and a review of the details of the administration of the bromides would have secured equally good results. It is this persistent attention to minor points, regularity of eating, bathing, administration of medicine, and all that hospitalization implies, that makes the result of institution treatment better than that of private practice.

The treatment of parents, guardians, and care-takers of epileptic patients is oftentimes quite as important a feature as the treatment of the patient himself. The necessity of deputizing the entire admin-

istration of medicine, as well as scrutiny of the diet, to some intelligent person who has the interest of the patient at heart is very urgent. It is wise to impress upon parents from the beginning of treatment the nature and probable outcome of the disease and the necessity for treatment as detailed and careful as that for typhoid fever. To carry it out without becoming discouraged, especially when in the beginning no great progress is made with the disease, is often very trying, and such parents require diplomatic handling more for the sake of the patient than themselves. All in all, the institutional plan of treatment for epileptics from the lower walks of life is best. For those whose providential position allows them to carry out the pedagogic, disciplinary, and therapeutic plan above detailed, this method offers all that science can offer for this unfortunate class, and it must be said it offers more than one usually infers from reading text-books on the subject. The treatment of epilepsy in reality is not the cultivation of a barren acre. Personally, I know of no organic disease of the nervous system of comparable chronicity and severity in which the results of treatment, intelligently carried out, are better.

Treatment of the Attack.

For the greater number of cases this can be summarized in a line: Place the patient in such a position that he cannot injure himself or destroy anything about him, and await the natural cessation of the attack. It is necessary usually to place something, such as a piece of cork, rubber, or the folded ends of a handkerchief between the teeth to spare the tongue from being bitten when the tonic spasm of the facial muscles forces the jaws together. If the patient is bound about with clothing in any manner, it should be loosened so that respiration and cardiac action may be in no way impeded. It should be borne in mind that attacks are liable to occur at night, and that sometimes such patients suffocate themselves, the result of crowding the face into the pillow, and precautions must be taken to avoid such accidents. When the convulsive part of the attack is over the patient should be given hot, concentrated liquid nourishment, and a full dose of bromide, which is to be repeated every few hours for several doses, in order to ward off a recurrence of the attack. After the convulsion is over the patient usually sleeps for a shorter or longer time and awakens feeling as though he had received a severe beating and with a confused, exhausted feeling in the head. In some cases it becomes necessary to employ means to cut short the convulsive part of the attack, particularly when there is a tendency for the patient to go into a condition known as *status epilepticus*, in which convulsive phenomena succeed one another with great rapidity and often without any intervening period of stupor. In the Hospital for Epileptics, where only the

severer forms of epilepsy are kept and where status epilepticus as a clinical manifestation is often seen, I have had the best results from the employment of inhalations of chloroform, given alone or combined with a few inhalations of nitrite of amyl. This procedure is strongly recommended. Occasionally after prolonged *status epilepticus* or after a number of attacks occurring in rapid succession the patient will go into coma. The most useful measures in such a condition are drop-doses of croton oil, if constipation exists, followed by coffee for its stimulant effects, small doses of belladonna and the application of an ice-bag to the head.

Domestic measures, such as causing the patient to swallow a quantity of salt or salt water, a procedure that is often resorted to amongst the unenlightened, are to be frowned at. They cannot possibly do any good. Another procedure which can do no harm, but for the utilization of which time should not be wasted, is the immersion of the patient in hot water, most often employed in the case of young children. The plan of cutting short the attack already mentioned is the rational as well as the efficacious one.

In some cases of epilepsy in which the convulsive phenomena are preceded by a warning, and particularly in those that have a sensory aura passing toward the head from one of the extremities, the attack may be prevented or its severity modified by subjecting the part from which the warning sensation passes to a smart blow or sensory impression. Just how the stimulus works is a problem in the dynamics of physiological psychology that no one has attempted to explain. The warning given to patients is never far removed temporally from the oncoming convulsions, and therefore the sensory insult must be made by the patient. To aid him in doing this it was suggested by Hughlings Jackson that a girdle be worn beneath the sleeve above the wrist, this being the usual starting-point of the aura, and as soon as the patient felt it coming on to give the girdle a powerful twist, or, if a loop, a tug at the free ends. It is really surprising how often this arrests the attacks in patients who have this kind of warning, but alas! these are very few compared with the entire number of epileptics. Occasionally the arrest of attacks in this way only robs the epileptic phenomena of the convulsive part, while the vertigo, stupor, and feeling of profound prostration following it are just as severe as after an ordinary attack. In such a case the patient has little to choose between.

It is not necessary to speak specifically of the treatment of the clinical forms of the epileptic neurosis, and I shall content myself by saying that the same general treatment is applicable in one form of the epileptic neurosis as in another. The treatment of the attack may vary somewhat. In epilepsy procursiva, for instance, and in some manifestations of the epileptic equivalent it is necessary, in order to

prevent the patient from doing injury to himself and perhaps to others to restrain him, although he does not appear to be devoid of his faculties. Some sleep seizures usually reckoned as somnambulistic are often of an epileptic nature, and their occurrence calls for stringent measures taken to combat the neurosis. Likewise a considerable proportion of the cases of dual personality are explained by the fact that their one personality is the normal one, the other an epileptic one.

Traumatic and Accidental Epilepsy.

These forms of epilepsy do not necessarily mean that the true epileptic neurosis is present at all, although the *habitus epilepticus* may and does develop if the disease continues for any considerable length of time. The treatment of the traumatic and accidental epilepsies depends very largely upon the origin of the disease of which the epileptic attacks are a symptom. If it is due to trauma that has set up changes of an irritative nature in the cortex of the brain or the tissues in juxtaposition to it, and if it can be localized, the proper and only treatment is to excise it at once. Experience of the last few years has taught that the skull-cavity can be entered, if done with great skill and care, without materially jeopardizing the patient's life. If the lesion can be found, be it of the calvarium, the meninges, or the cortex, it should be completely excised. It needs to be borne in mind that the danger to the patient is not materially added to by the removal of a generous piece of the cortex in which the lesion is situated or on which it has made pressure. The reason why so many cases of Jacksonian epilepsy fail to be cured by operation is that the operation is not undertaken early enough. If the diagnosis can be made before any considerable amount of change goes on in the brain which forms the anatomical basis of epilepsy, be the lesion in the terminals of the dendritic processes the probable one or be it an increase of neuroglia substance, the chances of success from the operation are good—much better than some writers are willing to concede. This statement holds true only when the operation is undertaken when the patient has as yet had only a few attacks.

I have under observation now a young man who was operated on four years ago, and a large portion of the cortex, which showed striking changes of meningo-encephalitis, removed, who has been absolutely free from any sign of epilepsy ever since immediately after the operation. The diagnosis in this case was made after the second convulsive attack. The practical point to be remembered about these cases, in addition to what has been said, is, that even though the operation has ameliorated or apparently cured the disease, the patient should be kept on moderate doses of bromides for from two to three years

after the last fit. When the duration of the case and the character of the attacks put it beyond the pale of operation, treatment is in nowise dissimilar to that of true idiopathic epilepsy.

I believe that I have already said sufficient in answer to the question, What can we expect from the surgical treatment of epilepsy? in the remarks on the treatment of traumatic epilepsy. But let me summarize the matter in a few words:

The present generation of physicians has witnessed the most remarkable advances of surgery that have ever been made. This may in a way account for the furor for operating on all sorts and conditions of epilepsy that seemed to take hold of surgeons the civilized world over a few years ago. If it does not, I am unable to suggest the answer. That such a furor existed no one who examines the literature can deny. The result of this experience would seem to be that, to-day, operation on the skull, trepanation of the skull, incision of the membranes and the removal of cortex, is only justifiable under the conditions already mentioned. Absolutely nothing is to be gained by subjecting any other types of epilepsy to operation.

It has often been noticed that in almost every case after operation there is a temporary cessation, of greater or less duration, of fits. This has been attributed to the effects of the operation *per se*, and it has been pointed out that a corresponding respite follows any operation, it matters not on what part of the body it is made. I am inclined to believe that the operation *per se* has very little to do with diminution of frequency of the fits, but that it is due to hospitalization, limited, selected diet, careful nursing, the discipline of regularity, and increased amount of sleep.

The fact needs no mention that the treatment of epilepsy which is symptomatic of new growths, pressure, or any localized lesion, is to remove it and thus get rid of the source of irritation, even if only amelioration is gained by such treatment.

True syphilitic epilepsy—that is the epilepsy of luetic meningo-encephalitis, gummatous infiltration of the meninges, localized syphilitic disease of the blood-vessels and localized cortical gummata—a disease which naturally occurs only after adult age has been reached, and then not so often in the opinion of the writer as some American and foreign authors would have us believe, requires rational and vigorous anti-syphilitic treatment. It is not sufficient to give mercury alone; that powerful absorbent of newly-formed granular tissue, iodide of potassium, must be given also, in very large doses and freely diluted with water. In the administration of mercury the writer has a personal preference for its use by inunctions. If inunctions are properly done, it would seem that the patient can be brought more quickly under the curative influence of the drug than in any other way,

save hypodermatically. Genuine syphilitic epilepsy often assumes the clinical form of Jacksonian epilepsy, and this is a variety of symptomatic epilepsy that should not be subjected to operation for the removal of the *materies morbi* until anti-syphilitic treatment has been tried and found lacking. The scar-like tissue that is sometimes left after the absorption of granular masses constituting syphiloma by vigorous anti-syphilitic treatment sometimes keeps up symptomatic epilepsy after the real growth has disappeared under medication. There is no reason, if the surgeon will undertake it, why these scars should not be excised, and if on opening the skull he finds remains of the syphilitic new formation with which the anti-luetic treatment has not been able to cope, they, too, should be removed.

Syphilis produces epilepsy sometimes not by the presence of syphilitic new growths in the meninges and cortex, but by setting up in these parts a degeneration which is now usually called parasyphilitic, and which is comparable to the lesions of tabes and general paresis—syphilitic in origin, but not syphilitic, or at least not characteristically so, in nature. The treatment of this form of epilepsy with anti-syphilitic measures is useless, if not worse than useless. If it be granted that after death these cases do not reveal lesions that can in any way be considered syphilitic it is hard to suggest a reason why they should be subject to anti-syphilitic treatment. The treatment that these cases require, and the one that is most serviceable, is the combined tonic and bromide plan, the nutrition of the patient being kept up to the highest possible point all the time. These cases do not tolerate anything like the quantities of bromide that a case of congenital epilepsy does and it is necessary to be on the careful lookout for toxic symptoms of this drug, for it is in these that sad results from careless administration of bromide is often seen. The general dietetic, hygienic, disciplinary treatment of this form of epilepsy does not differ from that of the form first considered.

The treatment of epilepsy that develops for the first time in later life, epilepsia tarda, is a different matter from the treatment of primary idiopathic epilepsy. In the majority of cases this form of epilepsy is an expression of some diathetic condition anterior to the epileptic attacks, and it is necessary to continually combat this while treatment is being directed to the symptom epilepsy alone. The real anti-epileptic agent in these cases as in the others is bromide. Its beneficial effects are often materially increased if combined with nitro-glycerin.

The general treatment of these cases differs in a way from that suggested for the parasyphilitic variety. The danger of the *status epilepticus* is particularly great, and there should be no hesitation in attempting to cut it short with chloroform and nitrite-of-amyl inhalations.

HYSTERIA.

The treatment of hysteria requires more tact, perseverance, and industry than any disease in the domain of neurology. I shall consider the subject under three headings: 1. The prophylactic treatment; 2. Treatment of the psycho-neurosis; 3. Treatment of an attack, and of individual manifestations.

The nature and genesis of hysteria cannot be discussed to any extent here. It seems to be universally conceded that hysteria is a nervous disease, using the term in that broad sense to include all of the psychoses in which a dynamic perversion of neural energy constitutes the basis of the innumerable symptoms. The ancient conception of the disease made it an attribute of the reproductive organs and restricted its occurrence to the female; a more modern one looked upon it as a shortcoming, and reckoned it in the category of conceit, affectation, and other attributes of puerility and of defective evolution; but the most modern view, the one that I have mentioned, associates its genesis with distinct neuropathic heritage as a predisposing cause, and psychical trauma, and all things contributing to it, as its most important exciting factor.

Hysteria, in other than its minor forms, which are not infrequently seen manifest in literature, art, politics, and religion, is relatively uncommon in this country. In the Latin countries and their territorial environment, such as Austria and Switzerland, it is a very common disease. Like all degenerative neuroses and psychoses, its treatment should be begun before the birth of the child who is heir to it. It cannot be too strongly urged upon physicians who have the care of families that the direction of an hysterical woman's pregnancy should be with the end in view to bring forth a child with a stable nervous organization, as well as a successful accouchement. This can in a measure be contributed to by studiously arranging her environment so that everything that contributes to mental equanimity and self-restraint is in evidence. All things conducive to the opposite are to be avoided.

The children of hysterical mothers should be removed from the tutelage and espionage of the latter as soon after the actual formative stage of the child's real character, from the sixth to the tenth year, as possible. Such a plan contributes not alone to the welfare of one, but is beneficial to both.

The education of children of hysterical parentage calls for nearly the same amount of intelligent co-operation between the physician and the pedagogue as does that of defective children. The details of such treatment must suggest themselves to every intelligent family

physician. All manifestations of precociousness are to be discouraged, childish coquetry and self-indulgence is to be exterminated, and the epochal period of menstruation and maturity is to be jealously guarded. The trend of modern civilization in this country, happily, is toward the development of the body, the cultivation of out-door sports and plenty of refreshing sleep for children; these are inimical to the development of hysteria. Inculcation of the precepts of self-control, generous feeling, altruistic sentiments, and intolerance of mawkish sympathy does much to prevent hysterical tendencies. The psychical trauma which starts the dynamic defects of hysteria into existence are often traced to terrorizing tales of the nursery, to sentimental *affaires de cœur* which the *fin de siècle* girl is often permitted to take seriously, to the assumption of marital obligations by persons totally unfit, and to abnormal indulgences such as *coitus reservatus*.

The general treatment of the profound neurosis hysteria is not easily disposed of in a few paragraphs, so varied are the physical, social, and mental conditions which have to be contended with. Very often the measures to overcome the collective manifestations that constitute the state hysteria must be applied hand in hand with those taken for the relief of some particular symptom, such as contracture, paralysis, or blunting and obscuration of some special sense; so although I shall have to speak of these measures separately the truth of this statement should be borne in mind.

The first most important step in the treatment of an hysterical patient is for the physician to put himself entirely *en rapport* with the patient and family of the patient—that is, secure the confidence of the former and the co-operation of the latter. In the severer forms of the disease, a most important disciplinary and hygienic measure is complete or relative isolation, a plan which all concerned are apt to look upon as an unnecessary cruelty directed against one who has been able to exist only because of the tender care and continous sympathy that have been lavished upon him or her. Even in the milder forms of hysteria, and by this we mean any hysterical manifestation short of *grand hystérie* and the clinical conditions unfortunately called hystero-epilepsy and hystero-catalepsy, it often becomes absolutely necessary to separate the patient from her previous social and family environment, not only to overcome the comparatively mild manifestations of the disease, but to prevent it from getting a firm hold upon the patient. In many cases uncontrollable exigencies will necessitate that partial isolation be carried out in the patient's home or in a hospital, but whenever feasible it is best accomplished away from home in a sanatorium or house directly under the physician's medical supervision, and in every instance it should at

least be so complete that the patient comes in contact only with strangers.

Anything that tends to lower the patient's nutrition and vitality is conducive to hysterical manifestations. These accidents are to be guarded against, and when they occur they must be amended as soon and as thoroughly as possible. The helpful measures to attain this end, aside from regulation of the digestive organs and scrutiny of the diet, are hydriatric procedures, massage, exercise, and electricity. When whole volumes are devoted to hydrotherapeutics it is easily seen how difficult it is to convey a just appreciation of its merits in a few lines. In a general way, however, it may be said that for all hysterical phenomena, with the exception of spasms, cold water, in the shape of douches, ablutions, plunge, wet pack and drip-sheet, is the serviceable form. Its use is intended to serve two purposes: tonic and sedative. The tonic effects are obtained principally by the use of the douche, the one essential physical element of which is pressure, directed particularly to the spine and to the solar plexus; by the plunge, which gives a profound shock and is followed by a reaction and beneficial metabolic changes; and by the spray or needle bath, the beneficial effects of which are on the peripheral nerves, vasomotor, sensory, and motor. For the many details of the practical applications of hydrotherapy the reader is referred to special works on that subject. I do not mean to convey the impression that in order to get all the benefit to be had from these procedures it is necessary to have any elaborate apparatus. All that is really needed is a tub, a piece of hose-pipe with a detachable spray, if the requisite pressure can be obtained, and a pitcher. If it is decided after trial and careful consideration of the patient's tolerance, *i. e.* the reaction and after-effects, that the most beneficial impress can be made upon the *morale* and nutrition by means of the douche, its application will have to be guided largely by individual idiosyncrasies of the patient. In some instances reaction will be accompanied by frontal headache lassitude, cold extremities, and ballooning of the abdomen. In such cases these can usually be avoided by having the patient's head enclosed in a towel wrung out of iced water, and by having the douche of from 50° to 70° F. applied for one to two minutes' duration while the patient stands in warm water. Cold water can often be utilized to great advantage by the use of the dripping sheet, particularly if the patient is sleepless, applied just before retiring.

When the spray or needle bath is used it should be borne in mind that this is one of the most potent ways of dissipating bodily heat, and the precaution taken of applying it for not more than a few seconds and of seeing that becoming reaction follows its application. The cold plunge-bath, when the patient's circulation will allow of its

use, is one of the best general tonics, particularly if the patient remains in the water for only a few moments, and during that time active friction is kept up either by an attendant or the patient himself, and after the bath vigorous towelling or percussion. If the plunge is too great a shock, patients can often be educated to it by beginning with a temperature of 80° to 90° F. and each day making it five degrees less, until finally it can be taken at the temperature of the room—that is, of a bath that has been drawn for considerable time.

The technique of hydrotherapy is best gained by experience, and whenever feasible the physician should avail himself of a properly equipped hydriatric institution. Its application will be most satisfactory, however, when the physician gives personal supervision.

Electricity is another agency of very considerable value in the treatment of hysteria. The form of electricity that is most useful is often best decided after trial. Usually it is either faradic or static electricity. The latter is often frowned at nowadays, as it plays such a conspicuous part in the armamentarium of the charlatan, but it must be admitted that it frequently has not alone a commendable moral effect, but also acts as a powerful tonic to the muscular and nervous systems as well. In fact, its action is not unlike that of another therapeutic procedure which has come much into vogue in our day, rapidly repeated and multiple percussion advocated by Granville. This form of electric energy has the same characteristics as faradic—viz., high tension and slight quantity—and often has quite as good effects in hysteria. It is not so applicable to erethitic and painful states as is faradic electricity of the long coil and rapid vibration. I am not able to speak of the efficaciousness of the electric bath and electric douche from the standpoint of any considerable experience, but what I have seen of these procedures abroad has not greatly prejudiced me in their favor. In some instances in which hyperæsthesia or anæsthesia is not being specifically combated, and when electricity is applied for its general tonic effects, general faradization is one of the most satisfactory ways of using this agent.

Massage, Swedish movements, calisthenics, and various forms of parlor gymnastics are often efficaciously employed to combat certain manifestations of asthenia and to increase muscular tone while the patient is undergoing home-treatment. The various forms of exercise such as golfing, bicycling, climbing, and the like—which are so often serviceable not only to improve the patient's general condition, but also to teach them self-reliance and make them less indulgent and introspective—all may be made to play a very important part to prevent hysterical paroxysms or to assist in recovering from them. Although the life of an hysterical patient should be one of physical

activity, in some cases it is necessary in the beginning to form a plan of treatment known as the rest-cure, as proposed and carried to such a point of efficacy by Mitchell, or a modification of it. I hesitate, however, to use the label "rest-cure," for it has been my experience that a rest-cure labelled and carried out in the perfunctory way—that is, without the greatest circumspection and variation of detail for every patient—is about as hazardous a formulated draft of rules as can be put into the hands of an inexperienced and injudicious physician. I have therefore thought it wiser to discuss the various details and allow the reader to label them as he likes.

The medicinal treatment of the psychoneurosis hysteria does not call for extended discussion, for the truth is there are no indications for medicinal treatment, save to meet certain special indications. Unfortunately, the salts of bromine are very extensively used by the general practitioner. There are more dangerous and pernicious methods of treating hysteria than this, but they are very few. I do not mean to convey the impression that a few doses of a bromine salt are not frequently indicated to overcome special manifestations of erethism and excitement. It is routine treatment by bromide that is so pernicious. The administration of foul-smelling medicines (valerian and musk) and of substances that color the urine (such as methylene-blue) may make a mental impression that is beneficial.

The regulation of the various functions of the body, such as that of the bowels, the kidneys, and the reproductive organs, I do not understand to require explicit directions here, more than to say that careful consideration of them will be rewarded in this disease, as it is in all others where there is a dissociation of the production and expenditure of energy. Restoratives such as iron and cod-liver oil, appetizers such as the simple bitters, and occasionally sedatives, particularly those acting on the sympathetic nervous system, all have an important place in the therapy of hysteria.

Treatment of Individual and Associate Manifestations of Hysteria.

The most common individual and associate manifestations of hysteria are hysterical paroxysms or convulsions (which may vary from slight perversion of emotional display up to the most violent and alarming state of clonic and tonic convulsions associated with the most repulsive and gruesome distortions and condition of spasm the continuance of which is inimical to life); contractures; paralyses; blindness; deafness; trophic troubles such as œdema and atrophy; anorexia; vomiting; mutism; pseudo-angina; colic; clavus and rachialgia, and so on almost to the end of all the diseases that are accompanied by suffering, deformity, or outward manifestation.

It is with the treatment of the spasmodic and convulsive phenomena that we are particularly concerned, although I cannot consider these without referring to other accompaniments, for many of them (known as "stigmata") are the constant and pathognomonic attendants of hysteria.

In the treatment of the spasmodic accompaniments of hysteria the first point that I wish to impress is that there is rarely any need of great haste. I say this on account of the fact that the most common proceeding for the physician when called to a patient in the apparently agonizing condition of a hysterical paroxysm is to conciliate the family by cutting it short with a hypodermic injection of morphine—as baneful and ill-advised an action as can be easily imagined, and one that should scarcely if ever be resorted to. The first thing to be done is to dispense with the aid of sympathizers, busybodies, and other unnecessary elements of the gathering which is sure to be about the patient. The physician owes it to himself to assure the family that he stands between the patient and danger and that although the attack may last for some time the eventual outcome will be satisfactory. The patient should be placed so that she cannot hurt herself or do violence to things or persons about her, and, if there be any necessity, no hesitation should be had in the use of artificial measures of restraint such as the "captive" sheet or a strait-jacket. If there be any danger of asphyxiation the patient should be given a few whiffs of chloroform, and this measure is always to be preferred to morphine. Sometimes by aid of this the patient can be transferred from an hysterical, convulsed condition, particularly when aided by suggestion, into one of quiet somnambulism. And in all cases when the condition of the patient will allow of it an endeavor should be made to quiet and assure the patient by suggestion and so carry her into a somnambulistic condition. Very often when the patients are in a state of apparent or complete unconsciousness they can be sufficiently aroused by pressing on hysterogenetic zones to allow them to become amenable to suggestion. In some cases, and particularly in those in which the physician has reason to believe that severity of symptoms is being in part simulated, putting the patient abruptly into a cold bath has the most salutary results. The value of prolonged warm baths in hysterical convulsions, as in all other convulsive conditions, has been greatly overestimated, and resort to it generally represents time wasted.

I have sometimes thought that a capsule containing valerian and compound spirits of ether had some influence in warding off an attack if the patient took it when she believed she had premonitions of an attack, but I am willing to believe that it acts, not by virtue of the

drugs, but by suggestion. I have, however, seen a dose of apomorphine clear up a hysterical paroxysm with great celerity.

There are very few if any cases that do not submit to the procedures that we have mentioned. The treatment after an attack is that already detailed directed against the general neurosis.

Here it is fitting to say a word anent the surgical procedures, particularly on the generative organs, that have been proposed for hysteria. They are particularly the removal of normal ovaries (oöphorectomy so-called), hysterectomy, clitoridectomy, and castration in the male. I do not mention operation on the coccyx, on the vagina, etc., because these are insignificant when compared with the others mentioned. It should be repeated that no one can be more solicitous that all parts of the body should be carefully examined and restored to conditions of normal functioning than the writer, and if it requires a galaxy of specialists or a general practitioner to do this, their services should be enlisted, so that the object may be attained. After saying this, however, I deem it fitting to say that the same punishment should be meted out to the man who wilfully removes a normal uterus, ovary, or testicle, or one not so far diseased that it cannot be nursed back to a normal condition, as is judicially given to him who premeditatedly takes deliberate aim and maims with weapon of any sort a fellow creature. In the light of a comprehensive knowledge of the reports of "cases of hysteria and hystero-epilepsy cured by surgical procedure upon the generative organs," I say that I refuse to believe that one example of the neurosis hysteria has ever been cured by such barbarous, unscientific, unrighteous measures.

The place which hypnotism holds in the therapy of hysteria has always been and will probably always remain a very insignificant one, using the term hypnotism in the only sense in which the majority of the profession, in common with the laity, will use it, viz. that of carrying a person into some degree of unconsciousness by means of impressions made on some one or all of the special senses. I believe that suggestion, whether by word of mouth, by precept, or by ocular demonstration, may often be used most beneficently, and if these be reckoned hypnotic procedures they have a legitimate place in the therapy of this neurosis. But to abuse them, or to surround them with any air of mysticism, or to flaunt them as an unusual, or individual, possession is to place one's self on the same plane with the charlatan or the negro hoodoo. It is far better to avoid the use of hypnotism entirely as a definite procedure than to abuse it by borrowing the airs of a professional hypnotist.

The treatment of the various stigmata of hysteria is the treatment of the neurosis itself; only a few of them deserve special mention. The proceeding known as metallo-therapy may have some slight

efficacy in dissipating hysterical anæsthesia, and may be made use of to the extent of laying on pieces of magnetized iron or simple strips of copper, but to speak of their beneficial effects when administered internally is to confess an entire ignorance of the rationale of their occasional effectiveness. Hysterical anorexia is often a most obstinate symptom to overcome, and all the paraphernalia of general and local treatment must be brought to bear on it. Forced feeding should be left to the last.

Hysterical contractures are usually amenable to massage and faradic electricity. The application of the latter by means of the faradic brush is often most efficacious in overcoming anæsthesia. Occasionally to overcome the contractures the aid of complete etherization or chloroformization must often be espoused, and the co-operation of the orthopædic surgeon, with his splints and braces, enlisted.

OCCUPATION SPASMS AND CRAMPS.

A SPASMODIC or cramp-like condition in individual muscles or groups of muscles that act together in the performance of certain acts of co-ordination such as writing, telegraphing, piano-playing, and similar occupations, and which completely incapacitates the possessor from further indulgence in such occupation, is a condition which the physician is frequently called upon to treat, and one which often taxes his skill, patience, and ingenuity. The number of these occupation "cramps" becomes greater every year in proportion as human inventiveness devises new sports or labor requiring complex co-ordinated muscular activities.

The most common of these affections at the present time are those just mentioned, to which may be added similar conditions occurring in milkers, golfers, cigarette-rollers, smiths, ballet-dancers, pianists, tailors, and pressers.

Writers' cramp (graphospasm, or mogigraphia) is the most frequent of these, or at least has been until latterly, when the typewriter is replacing the scrivener. It is the most obstinate to overcome, and it may be taken as a type of this class of disorder.

For a long time occupation-cramps were considered to be an expression of fatigue and exhaustion of peripheral parts, of the structures in which the spasm is manifest. This view is held by none except venders of apparatus to cure writer's cramp at the present day, and the symptoms are looked upon as an expression of a constitutional neurosis called into activity by some persistent and fatiguing labor. Such a neurosis has no individual anatomical seat, except the collective motor and sensory neurons be so considered. Its occurrence in neuro-

pathic individuals and in those who manifest some evidence of nervous instability, such as neurasthenia, migraine, tic, neuralgia, or even organic nervous disease, is evidence that the condition is a constitutional one with a local place of display which occurs under the auspices of exhaustion. The treatment of the occupation-spasms can only be successful when this conception of their genesis is heeded and the plan of treatment based upon it. The local treatment of such a condition as writer's or telegrapher's cramp alone is never sufficient, no more than the local treatment alone of profound neurasthenia associated with enlarged prostate in a young man addicted to sexual excesses and irregularities would be considered sufficient.

The most essential feature in the treatment of these affections is cessation of the occupation which is the cause of its occurrence. Much may be done to prevent writer's cramp by the intelligent observation and care of teachers in correcting faulty methods of holding pen and pencil while the child is learning to write. More rapid and satisfactory progress is made with these cases if insistence on this is required from the start. Very frequently the relinquishing of occupation means cessation of one's livelihood, but it is far better to do this at a time when the patient has the capacity to turn to something else than to consume time which may be made valuable to him by treatment in the utilization of such makeshifts as writing with the left hand, employment of apparatus for writers' cramp, and, naturally, if the physician is consulted early he may counsel the use of large penholders or some apparatus, such as Nussbaum's bracelet, or that of Wolfe or of Anderson, that prevents the muscles from getting into such a state of contraction that cramp occurs, the use of the typewriter, etc.; and if at the same time active measures can be taken in the way of hydrotherapy, exercise, massage, electricity, tonics for the restoration of the general health, it may not be necessary to completely give over his occupation. Time will be saved, however, in every instance by so doing. When the patient has ceased or materially modified the occupation that causes the spasm he should be put through a restorative plan of treatment not unlike that employed for other neuroses, such as neurasthenia and hysteria, the object being to improve the nutrition, increase the bodily weight, secure refreshing sleep, develop muscular strength, and restore the equilibrium between production and expenditure of nervous energy.

Treatment directed toward the relief of the spasm should consist in enveloping the hand and forearm in a wet, cold pack once or twice a day, the use of a mild galvanic current directed through the brachial plexus, the positive pole over the latter, the negative at the back of the neck, for fifteen to twenty minutes each day, the administration of sedatives such as hyoscyamus, belladonna, chloral, and the vale-

rianates, and by the hypodermic use of strychnine in large doses, $\frac{1}{30}$ to $\frac{1}{15}$ of a grain once or twice a day directly into the tissues in which the spasm is manifest. This last measure is usually not required, but when the others fail to secure the desired benefit there should be no hesitation in using it.

Coincidently with the utilization of measures taken to better the general nutrition, local gymnastics and massage should be employed to strengthen the parts which are, or were, the seat of cramp. For this purpose massage and resistant exercises of the individual fingers and muscles of the hand and forearm should be practised most persistently. These measures are by far the most important, in conjunction with the general treatment, in restoring the patient to health.

A return to the occupation which excited the spasm should be delayed as long as possible, and at the slightest indication of a relapse of the condition it should be relinquished. The treatment of the various other forms of occupation spasms differs in no wise from that already detailed, except as influenced by the parts of the body in which they occur.

There are a number of spasmodic conditions, some of them analogous to the spasmodic tics on the one hand and the occupation neuroses on the other. They are masticatory spasm, nodding spasm or spasmus nutans, spasm of the tongue or aphthongia. Other spasmodic conditions, such as phantom tumor, rectal spasm, and œsophageal spasm, are purely hysterical. Spasmodic wry neck and facial spasm are considered as tic of the nuchal and facial muscles respectively.

The treatment of some of these conditions requires individual mention, such as spasmus nutans of infants, a condition which occurs very largely in rachitic children. The movements usually disappear after the patient is given thorough treatment with iron, preferably the iodide or Basham's mixture, hypophosphites, and cod-liver oil.

Masticatory spasm, if other than acute (which is sometimes excited by a chill, when it can be relieved by warm applications), requires the same treatment as facial tic, of which it forms a part.

The spasms which have been enumerated above and which are dependent upon the neurosis hysteria do not require treatment different from other hysterical manifestations. For their temporary relief I know of nothing that is more reliable than a mixture of belladonna and bromide of potassium, the former given up to its physiological effects. Other anti-spasmodics, such as valerian, asafœtida, musk, and chloral, may be administered, but they are rarely necessary.

THE MEDICAL TREATMENT OF INSANITY.

By H. M. BANNISTER, M. D.

The medical treatment of insanity in its wider signification includes the employment of all the means at the physician's command for the control and the cure of the disorder. It therefore includes the hospital treatment—the care and management of the insane in hospitals or asylums, where they are sequestered and restrained as well as treated medically in the narrower sense of the term. This is the more true since the hospital, from the nature of the case, is an indispensable adjunct to any treatment, properly so called, in a very large proportion of all cases of insanity, and not the least important of the agents which tend to the recovery. The seclusion, the discipline, the regular life, the change of surroundings, facilities for classification and association of patients, the means for their protection, the skilled attendance, and all the other appliances which are afforded by a well-equipped and managed hospital for the insane, are in themselves often sufficient to direct a case of insanity to a favorable termination. In these days, when so much is said in regard to the suggestive treatment of disease, the hospital for the insane may be considered one of the most decisive and effectual of suggestions.

Considering this fact, that separation from the patient's usual associations and more or less strict control by others are almost indispensable in the treatment of the majority of all cases of insanity, a more limited definition of the medical treatment has some difficulties. Since, however, the public and private care of the insane in hospitals or asylums forms the subject of a special article in this work, what is here considered will be limited to the medicinal, hygienic, dietetic, and moral measures that are available, with or without hospital treatment, and which come directly under the charge of the physician who has the medical care of the insane. Certain questions, such as those of restraint, seclusion, etc., which will be more fully considered in the article on the hospital care of the insane, can hardly be passed by altogether, but will be only briefly and incidentally treated in this article.

Insanity, looked at from a therapeutic point of view, may be considered as a symptom of disordered or defective functioning of the brain. When we take into account the relations of this organ with

the whole body and its direct and reflex connections, and its liability to be affected by derangements or diseases of all other bodily organs, the extent and complications of the subject become very manifest. We cannot confine our attention to the symptoms alone and ignore its possibly still existing and active cause; hence the necessity in every case of insanity for a thorough examination of all the bodily organs and the detection of any and all conditions that can cause or influence the disorder. The personal and family history and all the antecedents of the case are also of the highest importance, as affording valuable data that may guide to a proper treatment. We may find from such examinations that an attack of insanity is only the manifestation of a larvated malarial infection or the result of rheumatic poison in the system; it may be due to syphilis, to uterine displacement, or to disordered menstruation, or possibly to localized brain lesions; and in case of any of these there may be obvious indications for treatment. Besides such disorders as these, which directly cause the insanity, any coexisting bodily disease may materially affect its progress or prevent its cure; and the one universal general principle of the physical therapeutics of insanity is to exercise a continual watchfulness for, and to remove or favorably modify to the fullest possible extent, all existing morbid bodily conditions that can, directly or indirectly, exert any unfavorable influence. Following out this principle to its fullest extent, the therapeutics of insanity may take the widest possible range, and it would be useless to attempt to give any brief summary of the treatment of mental diseases.

Practically, however, we are compelled to treat insanity in the majority of cases as a disease by itself, and its somatic symptoms as consequences or concomitants rather than as causes of the original disorder of the brain. There is no human ailment that presents more difficulties in the way of obtaining its causes and antecedents: the patient himself is liable to be disqualified for a reliable witness by his disorder, and there are numerous and obvious reasons why the testimonies of friends and relatives may be defective or untrustworthy. In addition to honest ignorance, which is not exceptional, we have family pride, the desire to avoid disagreeable conclusions as to heredity, possibly also the not unnatural wilful suppression of important facts bearing on the case, all tending to render it the more obscure and to embarrass the physician. Another difficulty is to be found in the fact that mental disorders themselves obscure bodily symptoms, and the rational and even the physical signs of disease are apt to be modified or occasionally suppressed in the insane. This is true not only in conditions of advanced insanity, but it may also be the case, to a certain extent, before the mental disorder has fairly manifested itself. The insane belong very largely to

the class of neurotic and physically degenerate individuals, in whom the rational symptoms of disease do not always regularly make their appearance even in advanced stages of serious disorders. In persons of this type, aside from the predisposition due to the neurotic or defective organization, there may have been some masked ailment acting as an exciting cause, or some slight morbid condition, that would have been easily recognized and remedied in a normally constituted individual, but had passed unnoticed until it had thrown the already unstable brain into active disorder. This probably occurs more frequently than is generally supposed, for there is certainly a very large number of the insane in whom, beyond a possible neurotic heredity, there are no plainly recognizable bodily conditions to account for the mental disorder. The rôle that heredity or predisposition plays in the production of insanity is hardly to be over-estimated, and it is often found useless to search for causes that may have been themselves of very temporary nature, and yet sufficient to turn the balance between insanity and mental health.

Whether or not reliable data can be obtained from the history or examination, there are in all well-marked cases of acute insanity certain prominent indications for treatment. The beginnings of mental disorder do not, as a rule, come under the observation of the physician, except when it supervenes on some existing disease that is being treated or when it is connected with the puerperal condition. Usually we have to deal with a more or less advanced stage when the disorder is readily recognized by the friends and associates and perhaps by the patient himself. In this state of affairs the first matter to be attended to is to see that he is under proper observation and control. An insane person is legally, and often morally and completely, irresponsible, and others have to assume the responsibility for him; the persons and property of others must be protected, and he must be protected especially against himself. One of the first questions to be decided is whether asylum or hospital treatment is necessary. In cases of acute excitement there is usually little difficulty in deciding: the condition of the patient is such that under ordinary circumstances home treatment is impracticable. In some instances, however, owing to prejudices of friends, the objections to publicity, etc., removal to a hospital is not permitted, and in these the question resolves itself into one of expense. If it is possible to have the services of skilled attendants and to fit up suitable quarters at the patient's residence, a case of acute insanity can be successfully treated at home, though there are many disadvantages to such a course. When the patient or his friends cannot afford the great expense that proper home treatment involves, the hospital is the only resource. With depressed patients the case is somewhat different. The severer

forms require hospital care even more, as the subjects are dangerous both to themselves and others. The milder depressive forms of insanity can be, and constantly are, successfully treated at home; they are probably the most frequent and most curable phases of mental disorder, and yet they do not enter nearly so largely into the statistics of our asylums as this fact might lead us to suppose. The patients of these types are frequently not restricted in their liberty; they sometimes continue in their usual avocations, and are merely the office-patients of doctors and specialists. Nevertheless, there is an element of danger in the great majority of these cases; the possibility of suicide, and even of homicide, cannot be left out of consideration. A very large proportion, possibly the majority, of the suicides, and not a few of the cases of homicide, reported in the daily press are furnished by just this class. On the other hand, to a depressed patient of a certain type the commitment to a hospital may intensify his malady, retard or prevent its cure, and thus be a positive damage rather than a benefit. The responsibility of advising in such cases is a serious one for the physician, and it is impossible to lay down any general rules that will cover all possible conditions. The most that can be said is in case of uncertainty to give the safer course the benefit of the doubt. It is for these milder cases of depression that a system of voluntary commitment is desirable, or, frequently, if they can afford it, a sojourn in some sanitarium, where they can be under medical care and watchfulness and have some of the advantages without what is to them the opprobrium of a hospital for the insane.

The passive forms of mental disorder (stuporous insanity, mental hebetude), when simple and not alternating with or interrupted by attacks of more active derangement, can of course be treated at home, provided they can there receive the care and personal attention they require. As regards other forms, there is seldom much difficulty in deciding, except possibly in certain peculiar types of epileptics, which will be spoken of later.

Rest.—One of the most important things to be kept in mind in the general treatment of acute insanity is that it is an exhausting disorder, and that it taxes heavily the vital powers. We have therefore to combat exhaustion, and in many cases this can best be done by keeping the patient in bed. This when there is any excited or restless tendency requires close personal care, and usually it is necessary to have two attendants, one for day and one for night. Trained nurses may be employed for this purpose, but trained hospital or asylum attendants, if they can be had, are better. The value of this measure is proportional to the exhaustional element in the case; there are some in which it is hardly applicable, such as some cases of acute mania of the recurrent type or of circular insanity. The chief dif-

ficulty is the expense and the occasional lack of suitable attendants. It is often well to combine with this "rest-in-bed" treatment a certain amount of properly directed exercise, and in some cases it need not be continuous, even in the beginning of the attack. Any routine methods in this, as in other matters of the treatment of insanity, should be avoided; each case is a study demanding the best thought of the physician.

In meeting the conditions of exhaustion an equally important matter is attention to nutrition, and one of the first things to be done is to insure that the patient takes sufficient nourishing food. If digestion is disordered, that of course must be attended to, but in no case of acute insanity of the exhaustive type is it usually safe to neglect this question of feeding. The diet in acute insanity should be generous and ample; its details may be left to the dictates of medical common sense in each individual case. One would naturally hardly advise a too stimulating or carnivorous diet in certain phases of excitement, or, in short, the use of any articles of food contraindicated by the physical condition of the patient. Nor, on the other hand, is it usually necessary to adopt the ideas of certain writers who would exclude nearly all nitrogenous aliment in these cases. Early attention to this matter is required, because with the derangement of the brain the whole system is involved, and the appetite is not the safe and natural guide that it is in health. The excited patient does not recognize his bodily needs, and in the depressive forms there is often a positive aversion to food. If the cause of this can be found and avoided, it is the first indication for treatment; but often it is due to delusions, to suicidal intent, to a paralysis of the appetite connected with the mental disorder, or possibly to mere excitement, and in these cases active interference is required. Usually the patient can be induced to eat, or is passive and can be fed by hand, but in some cases forcible feeding is required, and must not be put off too long to the damage of the patient's welfare. In some instances food will be taken, but in insufficient quantity, and the patient will run down from want of nourishment, while it is reported all the time that he is eating regularly. Too close attention, therefore, cannot be given to this matter, as carelessness and too much faith in the friends' or the patient's own statements may have serious consequences. When the refusal of food is persistent in spite of the utmost tact and perseverance on the part of the attendants, artificial feeding in one form or another is required. Occasionally this can be effected by the nurse with a spoon or the feeding-cup provided with a small nozzle through which liquid food can be poured into the mouth; but very frequently in such cases, according to my own experience, the feeding-tube is necessary. This may be the large œsophageal tube, introduced through the mouth and carried down through the pharynx and œsoph-

agus into the stomach, or the smaller nasal tube, which is carried through the nostril and then down through the natural passages. The first of these has the advantage that it cannot well be forced through the larynx, and that it is almost invariably tightly grasped by and fills the œsophagus, thus precluding any possibility of regurgitation around it, and it is therefore perhaps safer in inexperienced hands. Against this may be counted the disadvantage that in excited or resolute patients it requires the forcing open of the mouth, which is exceedingly difficult at times and necessitates an unpleasant struggle, with the risk of breaking teeth. In spite of all appliances, such as instruments for opening the mouth, the use of restraining apparatus, etc., the introduction of the tube under such circumstances is apt to be a rather rough operation. The soft-rubber nasal tube introduced through the nostril has many advantages, and is much preferable in experienced hands. It requires no gag, no forcing open the mouth, but there are certain cautions to be observed in its use. Its small size makes it possible for it to slip between the vocal cords, and serious accidents have occurred in this way. A good precaution, if the patient will talk, is to get him to use his voice in some way after the tube is introduced and before any of the food has been passed through it. In any case there should be a certainty that the breathing is free and unembarrassed. Some patients also are apparently so constructed in the pharynx as to render the introduction of the nasal tube particularly difficult, especially if there is much resistance; but this difficulty can generally be overcome. The irritation it causes to the nasal mucous membrane is not serious, and after it has been used a few times it seems to cause very little if any discomfort. The tube should be of soft, flexible rubber, and should be long enough to reach to the cardiac orifice of the stomach. It should also be of the largest diameter that will permit of its introduction through the nostril. If too small, food may be regurgitated around it, and thus enter the air-passages and give rise to serious consequences. If this occurs, whatever the size of tube employed, it should be promptly withdrawn and the feeding stopped before any quantity of the liquid food can have entered the trachea. In subsequent feedings the larger oral stomach-tube should be employed, as less dangerous for such a patient in spite of its inconveniences. Accidents of this kind very rarely occur, but their possibility should be kept in mind, and the lack of sensibility in some insane patients makes them the more serious. The best method of using it is to introduce the food slowly from a fountain syringe or a funnel, though an ordinary bulb syringe will answer. It ought also to be securely attached to the nozzle of the syringe or funnel that is employed, as in case it should become detached it might easily be swallowed by the patient—an accident that has occurred. The feeding ought to be done by the

physician or under his personal direction, at least the first few times, on account of the possibility of accidents. If it has to be kept up for any length of time and there are no special difficulties, it may perhaps be entrusted to a well-instructed and competent nurse, though the presence of a physician is always advisable.

It is rarely necessary to keep up artificial feeding over any considerable period of time in ordinary cases, but it is frequently required a few times in the early stages of the attack. The filling of the stomach appears to have often a very beneficial effect on the excitement, and the process of digestion acts as a general sedative. The introduction of the stomach-tube for the first time is not an agreeable operation to the patients, and they will often voluntarily feed themselves to avoid its repetition. With determinedly suicidal melancholiacs, and with some others in whom the suicidal impulse is not notably strong, but who have an excessive aversion to food, it may have to be kept up for weeks or months. In one case of cyclical insanity of long period under my own observation the feeding-tube had to be employed during the whole of the stage of depression, lasting over eighteen months. Such cases, however, are very exceptional, and it seldom has to be employed for more than a few weeks at the longest, and can be dispensed with altogether in a large majority of cases. The proper time to begin forcible feeding is a matter that needs the attention of the physician, and it may easily be deferred too long. In mania gravis or acute delirium hyperalimentation is the main stay of treatment, and it can hardly be effected in every case without forcible means. In the severer cases of acute excitement the patients are also liable to suffer if feeding is neglected. With those of depressive insanity without continuous agitation the necessity is less urgent at the beginning, but these are the cases that are ultimately most likely to require it, and in whom it has to be longest continued. In paranoia, where the refusal of food is due to a delusion, and in some hysterical cases, if there is no great bodily waste, there is not usually very great urgency for immediate forcible feeding, and it need not be resorted to unless every other means has been tried and the patient's condition is threatening.

The food used with the stomach-tube must necessarily be liquid, and there is nothing better, as a rule, than milk and eggs. From a pint and a half to a quart of milk, with one or two raw eggs stirred up in it, and given two, or preferably three, times a day, will suffice in ordinary cases of refusal of food to keep up the patient's strength and prevent inanition; but more frequent feeding is often advisable. It is better administered with the patient lying down, especially if there is much resistance, and some sort of restraint, either manual or instrumental, is often necessary. The diet can be varied as may appear

desirable, occasionally with broths, etc., and the times of feeding afford the opportunities for administering the necessary medicines, which can be added to the food.

The Excretions.—A matter of great importance is to attend to the condition of the excretory functions. It is the rule in acute insanity to find a sluggish condition of the bowels, and this in many cases has preceded the attack for a period of weeks, or even months or years. Sometimes the rectum is clogged with compact masses of hardened fæces that may, in some instances, require operative interference before a free evacuation can be obtained. More commonly, however, the constipated habit is what we have to combat, but in all cases, or nearly all, it is well to order a simple enema of soap and water in the beginning of the treatment. This will be likely to relieve the lower bowel of any such mechanical obstruction as described above, can hardly do any harm of itself, and is not generally more difficult than to administer drugs to an excited or obstinate patient. Active drastic cathartics should be avoided; it is not advisable in any of these cases to produce a great amount of intestinal irritation or to deplete the patient by active purgation. All that is required, after the bowels have been fairly moved, is to follow up the treatment, so as to ensure their regular and natural action. This can be effected generally with the milder laxative medicines—such as some of the cascara preparations—and sometimes by the diet alone. Occasional recourse to enemata is also advisable in many cases; they need never be irritating, and may be made to act as a tonic to the lower bowel. I have often observed excellent results from the use of injections in relieving excitement or depression, and in some they seemed to be the starting-point of a rapid recovery. In some of these cases the mere mechanical relieving of the intestine of its burden of the fæcal masses has alone seemed sufficient to produce an almost immediate change for the better. In the vast majority, however, it is probable that the evil effects of constipation are not confined to the overloading and distention of the bowel and its reflex action on the brain; the retention of so much waste and deleterious matter in the body, in contact with surfaces that are more or less absorbent, can hardly fail to have an injurious effect, and the products of intra-intestinal putrefaction may play a very important part in producing the morbid action on the nervous centres which results in insanity. If this be the case, it would appear not irrational to use with, or follow up the laxative treatment with, some medication to produce an antiseptic action on the intestinal tract. Small doses of beta-naphthol or salol are not likely to be injurious, and are, I think, advisable, unless there should be some decided contraindication.

The majority of the patients in whom the sluggish action of the

bowels is a special object of treatment are of the melancholic type, and the symptom is more frequent and more characteristic of the depressive forms of insanity than of any other. Nevertheless, it is very often met with in excited patients, especially in the beginning of the attack, and some of the most difficult cases are met with amongst this class. I have seen instances of acute confusional insanity, associated with a very generally disordered condition of the whole alimentary canal, and the most completely locked-up condition of the intestines that has ever come under my observation in any disease whatever. In some of these cases, after relieving the rectum by injections, etc., I have obtained the best effects from the use of calomel in minute doses—one-tenth of a grain repeated every hour till eight or ten doses have been given or a free evacuation of the bowels has taken place.

It is not necessary in all cases, even in the depressive forms, to insist absolutely on a regular daily evacuation of the bowels, though it is better if this occur; but every precaution must be employed to prevent the continuance of the constipated habit. Attention must be given constantly to their condition, as costiveness or constipation directly aggravates the mental disorder.

More stress is here laid on this subject of the condition of the bowels in acute insanity than it receives in most text-books or treatises on the therapeutics of mental disorders. It appears, from my personal observations, to be one of the very matters that are often neglected, or that, at least, do not always receive the attention they deserve. We have toxæmia as well as exhaustion to fight in acute insanity, and it is in the intestinal tract that we have to meet its causes probably more frequently than anywhere else. There is no doubt that in giving early attention to these conditions we can sometimes strike at the root of the disorder; and this fact alone is enough to render it deserving of all the importance that has been given to it here.

The urinary secretion also needs attention, as in depressed and stuporous conditions the patient may neglect himself, and the evil consequences of retention of the urine may ensue. It is probable also that in mental disease the urine is changed in quality, and it fails to perform its normal function of removing toxic substances from the system, and thus aggravates the condition.

Sleep.—The next great essential in treatment of acute mental disorder is to secure for the patient sufficient and restoring sleep. Nearly all recent cases of insanity suffer from the lack of this: it is one of the most prominent features of the disease. The insomnia of insanity is frequently of the most obstinate kind; it may have preceded the actual outbreak, or what is accepted as such, for many weeks, and in some cases have become, as it were, a habit that has taken a firm hold of the

individual. In such cases it is, of course, not absolute sleeplessness, as the human system could not endure it, but the amount of sleep actually taken is unsatisfactory, and is near the minimum that the patient's powers of endurance will allow. This is more particularly the case in some of the acuter depressive types, while in active maniacal cases the loss of sleep may be more continuous over a shorter period. To remedy the condition the use of hypnotic drugs is naturally the first suggestion, and it is possible to commit the error of overdoing the medication. Any indiscriminating use of chloral or the bromides, which are the remedies most frequently resorted to, is to be deprecated. Insomnia is a symptom that may depend upon very different physical conditions: it may be caused by active cerebral congestion, or, on the other hand, it may be due to an exhausted and irritable state of the nerve-centres that is associated rather with an anæmic than with an overfilled condition of the blood-vessels. In the former case it can be often relieved by the use of a warm bath just before retiring; I have many times seen an acute maniac sleep quietly for hours with no other treatment. The bath should be fairly warm (90° to 95° F.), and generally need not be continued longer than twenty minutes or half an hour, and may be supplemented with cooler applications to the head. Chloral hydrate has been for many years the most universally employed hypnotic, and has been given in very large doses for the insomnia of insanity. It is undoubtedly the most efficient hypnotic we possess, but its employment is not without risk. It is not invariably possible in excited patients to be sure that there is no cardiac or respiratory complication that would render it a dangerous agent, especially in the doses that are sometimes employed. I myself have seen unexpected and undesirable effects from its use when I had reason to believe that there was no special contraindication, and the quantity taken was not excessive or more than had been repeatedly given on prior occasions to the same individual. For these reasons I have seldom administered it in doses of more than 20 grains, and then in combination most frequently with some adjuvant, preferably the bromide of sodium, either in equal amount or slightly in excess. When the sleeplessness of mania in the active congestive stage is not remedied by fifteen or twenty grains of chloral and twenty or thirty of sodium bromide, together with the warm bath and an enema before retiring, I prefer to use some other hypnotic rather than increase the dose. There are a number that can be resorted to, and some of them are hardly inferior to chloral in their sleep-producing effects. Paraldehyde is nearly a pure hypnotic but little less effective than chloral in many cases, and has not the dangerous debilitating action on the heart possessed by the latter. Its disadvantages are—the difficulty of disguising its disagreeable taste, the gastric irritation it sometimes pro-

duces, and the necessity of increasing the dose to produce the desired effects if its administration is much prolonged. Its steady employment is also liable to cause gastric and other disturbances, but in this respect it is hardly peculiar among hypnotic drugs. Sulphonal is another valuable remedy for insomnia, very effective in many cases of mental disorder, especially in women. In men the effects of this drug appear to wear off more rapidly; a toleration of the remedy as regards its hypnotic action seems to be sooner attained. It is rather slower and more lasting in its effects than some of the other hypnotics, and is therefore perhaps less adapted to acute congestive maniacal conditions than the chloral-bromide combination; but I have seen excellent results follow the administration in acute mania of as little as 10 grains, and have never seen any serious after-effects from a single dose of as much as 30 grains. It has, however, often been known to produce transient vertigo and ataxia, and in a few cases more serious symptoms of disturbance of motility and consciousness. In moderate doses (10 to 15 grains) it is a valuable hypnotic, and has the special advantage that it is almost tasteless, and can therefore be administered with the food if that is found desirable. It is not a good plan to give it continuously in any case. The dangers of this drug, that have been pointed out of late by Wood and others, can be avoided without losing any of the real advantages to be derived from its employment in suitable cases. Trional is more soluble than sulfonal and is said to be less cumulative in its action, which is otherwise similar. Other hypnotics that may be used are chloralamid, which is quicker and briefer in its sleep-producing effects, chloralose, chloretone, etc. Amylene hydrate appears to act very similarly to paraldehyde, but I cannot speak from personal experience with its use.

In some cases of acute mania, well nourished and otherwise in good bodily condition, nature seems sometimes to reassert itself, and there is a tendency to natural restoring sleep. In these patients a very moderate amount of a hypnotic drug is occasionally unexpectedly effective. I have seen a very deep slumber from which the patient could be aroused only with difficulty, and then immediately again fell asleep, almost resembling opium-narcosis in this respect, and lasting nearly ten hours, produced by a sedative dose that seemed entirely inadequate to produce such an effect. Commonly, however, the tendency is to bring about an exhausted and anæmic condition of the brain that tends to prevent sleep through pure irritability. In this state of things moderate or slight stimulation is often the best hypnotic; an ounce or half an ounce of whiskey in a half pint of milk, a glass of wine, or, better yet in most cases, of beer, at bedtime produces the best effects. One thing must of course be kept in mind in the employment of alcoholic stimu-

lants in this way, and this is of more importance in the home than in the asylum treatment of the insane; that is, to run no risk of arousing an appetite or forming a habit of their use.

Though not largely used, the hot wet pack is an excellent hypnotic in excited maniacal conditions, but more will be said later on, when the subject of hydrotherapy in insanity is discussed.

In agitated melancholia much the same measures to produce sleep are applicable as in mania, but there is in this condition another disturbing cause that often calls for special remedies. Melancholia has in it frequently an element of actual physical pain, which is, in the peculiar condition of the mind, felt to its utmost extent. In this condition an analgesic is required as well as an hypnotic, and for many cases opium in some of its preparations by the mouth or morphine hypodermically best answers the requirements. If opium is administered internally, it is usually not best to commence with more than the ordinary therapeutic dose: from 10 to 15 drops of the deodorized tincture is enough for a beginning, and it can be combined with a bromide, or cautiously with a moderate dose, not exceeding 10 grains, of chloral. The hypodermic use of morphine is preferable to the administration of opium preparations by the mouth for several reasons. It is, in the first place, quicker and more certain in its effects; there is less apt to be disturbance of the stomach; and its administration cannot be so effectually resisted if the patient is disposed to refuse treatment, and it is more under the control of the physician—an advantage that is not to be under-estimated in the home management of the disorder. It is well in these cases to begin with not over $\frac{1}{6}$ or at most $\frac{1}{4}$ of a grain, and carefully to watch the effects.

In some nervous and slightly hysterical cases I have observed very satisfactory hypnotic effects from a combination of the bromides—fifteen to twenty grains of the sodium or potassium salt, with a drachm of elixir of valerianate of ammonia—when other usually more effective drugs had failed. Enforced rest in bed, with thorough alimentation and care as to the condition of the bowels, is often of itself sufficient to bring about a habit of sleep in many depressed cases, and is a method of treatment more applicable in this form of insanity than in most other forms. The use of stimulants also—a milk punch at bedtime or a glass of wine or beer—is also more generally useful in melancholia, where there is presumed to be anæmia and insufficient nutrition of the brain, than in most cases of active mania, but the caution as to forming or awaking a habit needs to be still more emphasized in these than in the other cases.

Whatever hypnotic is employed in acute insanity, it is always well to discontinue its use at the earliest moment when it appears that the patient can obtain sleep without it. It is also unadvisable to admin-

ister the same remedy over any considerable length of time; it will generally be found better to change or alternate the drug employed with some other. The list of hypnotic remedies is long enough to afford considerable choice, and besides those I have mentioned there are others that are more or less highly spoken of, and that may be of service in special cases. In any case also it is generally advisable to intermit all hypnotic medication at short intervals, every few days, for a night or two, if it is required to be kept up over a considerable period of time. In doing this we diminish the chance of creating a habit or of inducing a toleration of the drugs employed, and also afford ourselves an opportunity to observe how the patient can get along without them, and of avoiding a too long continuance of their use. Remedies of this class are only harmless when actually necessary; if employed longer than they are really required, they are positively deleterious to the system.

Recapitulating, the universal requirements of the treatment of all cases of acute insanity are—

1. The proper control and supervision of the patient for the protection of himself and others. This can be secured only by proper attendance, and in a large proportion of cases can be best, if not solely, secured in a hospital for the insane.

2. Rest and quiet and proper and sufficient nourishment, by forced feeding if necesary.

3. Attention to the condition of the bowels and the excretions generally, and avoidance of any tendency to constipation.

4. Sufficient and restoring sleep. If this cannot be obtained by regimenal measures, such as warm baths, diet, etc., recourse is to be had to hypnotic drugs, which should be employed intelligently and with caution, frequently alternated and intermitted, and discontinued at the earliest moment when their employment is not absolutely necessary for the welfare of the patient.

To these four essentials in the treatment of all cases of acute or recent insanity should be added the universal general principle of the therapeutics of mental disease, which was stated in the beginning of this article—viz. to search for and discover any and every bodily disease or condition that may act as the cause of the insanity, and the treatment or removal of which may tend to its cure.

While the foregoing are the general essentials of the medical treatment of acute or curable insanity, they do not cover the details of the management of the various forms of mental disease. Nothing, moreover, as yet has been said in regard to the indications from the pathology of the disorder or of certain very important therapeutic agents and methods that require extended notice.

Taking up first the pathological conditions that may be supposed to

underlie the mental disease, the principal ones—and practically almost the only ones that we have to consider in relation to medical treatment—are those connected with the blood-supply of the brain. Whatever morbid states of nerve-cells and connections exist that are not connected with or dependent upon disturbances in the circulation, are not, as a rule, directly amenable to medical treatment, or at least we do not usually attempt to act upon them with medicine otherwise than by treating the symptoms they produce. Cerebral hyperæmia, on the other hand, has undoubtedly much to do in the production of many of the symptoms of excitement, and we can attack it directly. The use of warm baths with cold applications to the head, which have been already mentioned in connection with the treatment of the sleeplessness, the employment of ice-caps, occasionally also local irritation by mustard plasters, mustard foot-baths, etc., may be mentioned as methods of external treatment that may be of benefit. Local irritation by a mustard plaster over the cardiac region often has an influence in checking excessive action of the heart, and thus relieving the tension of the cerebral vessels in active congestion.

The medicinal treatment of these conditions consists mainly in the employment of the bromides, which are, considering all things, the best internal remedies at our command. Next to these, as controlling cerebral congestion, we may place ergot, which may be given either alone or in combination with the bromides. It may also be given hypodermically in the form of ergotin, and sometimes acts most effectually this way. The main dependence, however, is on the bromides, as far as drugs are concerned, in reducing cerebral congestion, but if carried too far they are apt to produce the uncomfortable symptoms of bromism. Their beneficial effects, moreover, do not continue long after their administration; they regulate the circulation for a time, but are not to be relied upon to remove the cause of the disorder. This must be done by restoring the general tone of the nervous system by tonics, good living, and proper hygienic regulations. The active type of brain congestion in insanity is not commonly a permanent condition; its tendency is to exhaust itself and the patient, and the real curative treatment is properly to be directed to this tendency. While we employ bromides, ergot, etc. to meet the immediate pressing indication, their use should not be continued long enough to lower the vital powers by disordering important functions or benumbing the nervous system. In that form of insanity in which the hyperæmia of the brain is probably most intense, acute delirium, only a vigorous supporting treatment affords any chance for the patient's recovery.

Passive congestion of the brain is not a condition that is always easily recognized in insanity: it probably often exists where it is not

diagnosticated, and *vice versâ*. So far as it can be especially treated there is not usually much difference in the measures to be employed from those used for the active form; warm baths, mild revulsives, bromides, etc. may all be of service.

In the later stages of acute mania, when the excitement has worn off and the patient shows a depressed or stuporous tendency, and in the depressive forms of insanity generally, the brain may be either in an anæmic or in a passively congested condition, and the symptoms may afford no indication as to which of these states is present. It is often, therefore, unadvisable to adopt very active measures based on any theory as to the pathological conditions, except so far as it is not incompatible with either one of them. Supporting treatment—consisting in good feeding; tonics, such as quinine, strychnine, etc.; occasional warm baths, and especially the Turkish bath, in which massage is used to supplement the hot bath; stimulants cautiously used under the direction of the physician; and possibly the use of tonic doses of opium,—is on the whole the safest to follow in those cases in which there is reason to suspect that either of these conditions exists, but when it cannot be decided which. Usually, we may infer that the pathological condition is more probably one of defective nutrition from anæmia and exhaustion; and this presumption may be allowed to have some predominant influence in choosing the course of treatment in cases in which we have to exercise a choice. When there are decided evidences of vaso-motor spasm of the cerebral vessels, as shown by pallor, dilated pupils, coldness of the head and extremities, tinnitus, vertigo, etc., the inhalation of nitrite of amyl is the remedy generally recommended, and its temporary effects are very marked. To be of value in the majority of anæmic cases the inhalations will require to be frequently repeated, and this method of treatment needs to be watched with care, and discontinued at once if there is any sign of its doing harm, such as may possibly follow if the diagnosis of the pathological condition is erroneous. If it is found beneficial and a more prolonged effect of the remedy is desired, nitroglycerin, internally, beginning with one-drop doses of a 1 per cent. solution from one to three times daily, may be employed, and the quantity may be cautiously increased, if found necessary, till four or five drops are taken at a time. It is rarely necessary to exceed this amount, and, in my opinion, the use of this drug should always be commenced with the smallest dose—one drop or even less—and never with several drops. These drugs, nitrite of amyl and nitroglycerin, appear to have a double beneficial action in these cases, dilating the peripheral blood-vessels and strengthening and freeing the heart's action, which is embarrassed by under-innervation or over-inhibition. These remedies, of course, are to be used with due caution in any case.

Alcohol and opium are the two other remedies that have been most generally recommended in anæmic conditions of the brain. I have seen decided benefit from single large doses of alcohol, but am not prepared to recommend it, as its effects have appeared at other times to be the reverse of beneficial. Its continued use is open to very serious objections, and I believe the same to be the case with opium. I have never seen the opium habit created by medical treatment in cases of insanity, but I can readily see how this might occur, especially in the milder neurasthenic types of mental disorder that are most likely to come into the hands of the physician for home treatment. It is as an occasional stimulant, however, in certain depressed and anæmic cases that alcohol is sometimes very useful, and in these, in my opinion, it is most effective when employed on rare occasions only, as its extensive continued employment is seldom beneficial, unless we make an exception of certain senile cases in which the milder alcoholic preparations may be useful. As a vaso-dilator in the stricter sense of the term it has but a limited field of usefulness.

With opium the case is somewhat different: it probably has, in many instances, a favorable action on the blood-vessels of the brain, relieving the vaso-motor spasm and aiding to bring about a more normal condition of the nutrition of the nerve-elements. I have seen apparent benefit from the continued employment of small tonic doses of opium—4 to 6 drops of the deodorized tincture—in depressed anæmic patients, and also from the use of gradually increasing doses. The special indication for its use is either mental or physical pain; hence its value in melancholic states. Experience has not taught me, however, to rely upon it to the extent that some authorities have advised; it is by no means a specific, and I can recommend its employment only experimentally, using caution and watching all its effects.

Naturally following the subject of the medical treatment of the disturbances of the cerebral circulation comes that of the management of the excessive motor excitement or irritability—one of the most prominent symptoms of most congestive and many anæmic conditions of mental disorder. This involves the whole question as to the use of sedatives in insanity, in regard to which there exist wide differences of opinion amongst authorities, and certainly a very wide range of variation in practice. It also includes the question as to the value and propriety of mechanical restraints, which is still to some extent an open one. There is not much doubt that both these methods of treatment have been misused, or rather over-used, in the past, and that the tendency at present is to a much more limited employment of such agencies. In well-appointed hospitals with ample and competent

attendance it is possible and desirable to do away almost altogether with mechanical restraint appliances, and the inconveniences that their disuse entails are more than compensated for in other ways. From a practical therapeutic point of view they are not useful, save for their moral effect as discipline in some cases; they do not relieve motor excitement, but simply embarrass its manifestations, and the chafing of the patient under the restraint may only aggravate his condition. What is called in hospitals "seclusion"—that is, the isolation and locking up of the patient in a room by himself—comes under the same condemnation as restraint, though occasionally it may be possibly beneficial for short periods in special cases. In this matter, as in almost everything else in the treatment of insanity, the utmost consideration must be given to the special needs of each particular case; the treatment must be individual in the fullest sense of the term.

As regards the use of sedatives, otherwise than for their hypnotic effects, there is less difference of opinion, though the term "chemical restraint" has been used in a sense of reproach as applying to their employment to suppress excitement. The fact that motor activity may not be always injurious, but sometimes beneficial and compensatory, does not destroy the other fact that there are many cases in which it is so excessive as to wear out the patient unless checked, and the only way in which this can be done successfully and thoroughly is by the use of sedatives. The question, therefore, has two sides, both of which should be carefully studied. The general rule in regard to the use of sedatives may be stated as follows: When a patient is in a condition of excitement and restlessness that tends of itself to exhaust his vital powers, or is such as effectually to prevent his taking proper nourishment, or is, in any way, under the conditions in which he is unavoidably placed, absolutely detrimental or dangerous to himself and to those who are compelled to be near him, some sedative treatment is not only justifiable, but is necessary. If a patient will take food, a full stomach is often the best of sedatives, but there are occasionally cases where even forcible feeding with the stomach-tube is almost impracticable. When sedatives are given it is important to see that they are not carried too far; they are more palliative than curative in insanity, and are likely, if too much employed, to do more harm than good. Their use should be discontinued or interrupted whenever it is not positively required for the reasons given above, and careful attention ought to be paid to their general effects on the physical condition of the patient. The general principle that acute insanity requires supporting treatment must not be lost sight of, and no accessory therapeutic measure should be carried so far as seriously to interfere with or embarrass the general nutrition.

When a sedative is required it is a matter of some importance that one is selected which is best suited to the case and least likely to do harm. The condition of the heart and respiratory organs must be particularly considered, as many of the more powerful sedatives have a special action on these organs, and any incautious employment of them may have disastrous consequences. Probably the safest of all sedatives are the bromides of potassium and sodium, especially the latter; they seldom have any bad effects when given properly diluted in solution, and they act as an excellent adjuvant to other more powerful quieting agents, enabling us to obtain fuller and more prolonged effects from smaller doses, and thus reducing the danger that might possibly result if the latter were employed alone in quantities sufficient to produce the desired effect. The prolonged use of the bromides, it is well known, has its disadvantages, but this is not to be counted on as necessary in the treatment of the excitement of simple acute insanity. I have often seen thirty grains of the bromide of potassium alone have very excellent effects in quieting an excited maniac; but as a rule I have employed it in such cases in combination. Clouston recommends it used with tincture of cannabis indica as the very best general sedative. Cannabis indica itself is often too uncertain; the preparations are not always reliable; and the same may be said of conium, which is, aside from this objection, one of the best of the motor depressants. Hyoscine in the form of the hydrobromate or hydrochlorate, employed hypodermically, is a very efficient pure motor depressant—probably the most efficient; but its use, like that of the other powerful alkaloids, requires great caution: not over $\frac{1}{100}$ of a grain is advisable at a dose. Hyoscyamine is a somewhat older drug that has been very extensively employed, and in rather perilously large doses, by some physicians. One-fiftieth of a grain is as much as should be ordinarily used hypodermically; in this dose it is often sufficient to quiet an excited patient.

It is often observed in asylums that when the patients can be kept out of doors largely the average of disturbance and excitement is very greatly reduced. It will be also found that in individual cases free air and exercise during the day are among the most efficient general sedatives, especially when with this the patient takes plenty of nourishing food. In caring for excited patients at home or outside of a hospital this out-of-door treatment, when good attendants can be had, is often one of the very best measures both for meeting the present difficulties of the situation and in tending to the ultimate cure.

Hallucinations and delusions, the most characteristic, and in common opinion the essential, symptoms of insanity, are not, as a rule, directly amenable to medicinal treatment. They are simply indications of the existing disorder of the brain; they are special symptoms of a general

condition of disease of that organ to which we direct our treatment. When hallucinations are especially persistent and localized in one or more of the sense-organs, and particularly if they are unilateral, it is well to look specially for local disease that may directly or reflexly have to do with their production. It may be found that some local oral disease or some visceral irritation has only to be treated to cause them to disappear. In the great majority of cases, however, the mechanism of hallucinations is beyond our reach by any treatment specially directed to them; they sometimes disappear very quickly with the use of remedies and measures adapted to the relief of the general morbid conditions presumed to exist in the brain, but we cannot name those that will directly act on the special sensory centres involved. Delusions are entirely beyond the reach of drugs, and moral and regimenal measures have only an indirect and uncertain effect in aiding in their removal. If certain psychological theories as to the mutual relation and interdependence of muscular action and ideation are accepted as correct, there is a possible suggestion of a kinotherapeusis that might be available for their relief. It is only a suggestion, however, as yet, and the possibility of its having any practical value may never perhaps be demonstrated. When it is practicable, nevertheless, properly selected and directed employment has its advantages; and it should be such as will divert the patient's mind from his delusions. If there is any way of treating the symptom of insane delusions directly, it is by judiciously directed rational employment. It is the delusional tendency and the defective power of judgment that have to be remedied, and it can only be in rare instances that special measures, either moral or physical, directed to the delusions themselves can have any favorable results.

A common and very aggravating series of symptoms in insanity are due to special excitement in the genesic sphere. These symptoms are indications of morbid irritation as well as of defect of moral inhibition, and, so far as they are due to the former cause, special treatment is to some extent available for their relief. If the irritation is peripheral, as happens to be the case sometimes, with females especially, such special or local treatment as will relieve the condition is of course indicated. It must be kept in mind, however, that when the origin of the condition is solely in the central brain disorder, there is apt to be a tendency in sexually excited females to call for local treatment. It is well in any case to observe closely the condition of the bowels and of the stomach, as it is not infrequently the case, in my opinion, that disordered conditions of these organs may at least aggravate or keep up the genital excitement. Pruritus of the anus, which is a very common neurotic complication of disordered bowels and digestion, is also a genital excitant, and has been responsible, I believe, for the habit of mas-

turbation in some cases that have come under my observation. Medicines alone are not to be relied upon, though they are often useful adjuvants to other treatment. The bromides have been usually considered the most reliable antaphrodisiacs, but opium, camphor, monobromate of camphor, and numerous other drugs have also been recommended. Local applications, such as blisters, have been very largely used, and have a certain moral effect in some cases, but otherwise the good they do is only temporary, and sometimes they appear only to aggravate the condition. The same may be said of mechanical restraint, which has been often employed. In extreme cases, in both sexes, castration has been resorted to, but the results have not, in the instances that have come to my knowledge, justified the practice, at least not so far as any permanent benefit to the general mental condition of the patient was obtained. It seems, indeed, to be more favorable to ultimate dementia than to anything else. The bad habits of the insane in this respect can be best combated by thorough watching during the day, and, when it is possible and not contraindicated by the physical condition, by such bodily exercise or work as will fully occupy the patient and produce a healthy fatigue that ensures sound sleep at night. This, with a regulated, not too stimulating diet, cold baths, etc., and suitable moral treatment, forms the best means for controlling the vice in the class of cases in which it usually is most frequent. These are commonly the chronic or slowly-developing types: when strong sexual excitement appears as a symptom of acute insanity, it is usually to be treated with the other symptoms of general excitement and by the same remedial measures.

From what has been already said in regard to the exhausting and depressing action of insanity on the whole system, it will be easily understood that tonics fill a large place in the general treatment of mental disorders. Under this head may be included not merely drugs, but also such general and special remedies as baths, massage, electricity, gymnastic exercises, and even travel and change of climate. All these have their advantages in certain cases, and some of them are especially useful. It is in the exhaustional forms of insanity and in the reaction stages of acute mania, when symptoms of exhaustion begin to appear, that treatment with tonics is especially indicated, but they are often beneficial throughout the whole course of acute attacks of insanity, whether of the depressive types or otherwise. The medicinal agents that stand highest in this class according to their usefulness in insanity are the cinchona preparations and alkaloids and strychnine. As general tonics the former of these in their various preparations are undoubtedly the best we have, and it does not seem probable that they will be ever altogether superseded by any other. Besides being a general tonic, strychnine has a special stimulant action on the nervous system, which,

as Spitzka has pointed out, is not exercised solely on the spinal cord. Neither of these agents should be used in large doses. I have observed, indeed, the best effects when the quantities given were comparatively small. Iron may be given in any form that may seem desirable; it is as efficient probably in the tincture of the chloride as in any other preparation. Arsenic is also a valuable tonic in insanity, and it appears to have occasionally some special effect on the mental condition, brightening it up in cases of melancholia, as well as physically toning up the system. From 1 to 3 drops of Fowler's solution two or three times daily is probably a sufficient quantity from which to obtain the good effects of the remedy in such cases. It can be administered either alone or with small tonic doses of opium—from 3 to 5 drops of the deodorized tincture. I have, as already stated, used these last in melancholia, and sometimes with advantage. To counteract any constipating tendency of the opium, moderate doses of some general mild laxative, such as cascara, were frequently given at the same time. Another tonic with special properties in depressive conditions is erythroxylon coca, and very small doses of its alkaloid, cocaine, have also been recommended as beneficial. These need not be continued over any length of time, however, unless they are found decidedly useful. The mineral acids also are often useful, especially when there is loss of appetite and atonic indigestion in mild cases of melancholia, and I have employed the popular preparation known as Horsford's acid phosphate quite extensively in such cases in doses of half a drachm or more.

The food-tonics, cod-liver oil, extracts of malt, etc., are also of great value in insanity, especially the former, which can be used in all conditions of nervous exhaustion and debility when a nerve-tonic is required and when it does not unfavorably affect the appetite. The compound syrup of the hypophosphites is also an excellent nerve-tonic and general restorative in such conditions, and is probably as satisfactory a means of obtaining the beneficial effects of phosphorus upon the system as any other.

There is no serum-therapeutics of insanity, but there is one animal organic preparation, thyroid extract, that is specific in that special form connected with myxœdema, and in myxœdematous idiocy. In other forms of insanity, but chiefly in melancholia, it is reported as having been of great benefit by Middleman. It is a powerful systemic remedy, but as yet we do not know its exact action in any case, and its use must be experimental and cautious.

Baths play a very important part in the therapeutics of insanity. Mention has been already made of the utility of warm baths in conditions of excitement, especially when combined with cold applications or affusions to the head. The wet pack, especially the warm pack, has also a very powerful calmative action. In the home

treatment of excited patients it may be very useful, but its effects need watching. The shower-bath also is a powerful tonic and revulsant that has been brought into discredit in the treatment of insanity on account of former abuses. Bucknill and Tuke recommend its occasional employment in melancholia, the duration of each time being from fifteen to thirty seconds. The tonic effect of cool baths (temperature of 60°–75° F.), and even of cool sponging in the early morning, is very useful in many of the milder neurasthenic cases of melancholia.

Warm baths and the wet pack are powerful excitants of the functions of the skin, but still more efficient are the vapor baths, the Russian and the Turkish baths. The former of these is a simple vapor bath, ending generally with a cold douche or shower-bath; the latter is essentially the same, though dry heat is more employed, but combined with physical massage. It has therefore some advantages, and is very highly recommended by T. W. Kellogg, who says: "From our experience with this remedy we consider it especially applicable in the following class of cases: In melancholia, with the skin dry, harsh, and of furfuraceous aspect; in primary dementia, in which the capillary circulation is greatly impaired, the excretory functions of the skin are suppressed, and the whole surface has a cyanotic appearance; in alcoholic mania, with organic weakness of the liver and kidneys and with tendency to anasarca; in epileptic mania, where the physical disease is masked and exacerbations of mental disturbance take the place of the convulsions; in cases in which there is restless excitement with hyperæsthesia of the skin, tactile illusions, and perverted sensations of the peripheral nerves; acute and chronic mania, as an effectual sedative to violent excitement where narcotics are contraindicated; in a numerous class of cases in which the manipulations of the bath afford an admirable passive exercise, which is a substitute for the more active exertion which the patient is unwilling or unable to make, either indoors or in the open air; in cases of organic disease of the brain, heart, or lungs it is a valuable adjuvant in palliative treatment, but it must be used very guardedly. The same caution is not required in cerebral congestion due to functional derangement, in which its use is followed by marked relief."

The foregoing appears to sum up nearly or quite all of the conditions in which the Turkish bath can be expected to be of decided benefit; it is undoubtedly a powerful therapeutic agent, and when available may often prove a valuable adjunct to other methods of treatment.

The very prolonged warm baths combined with the cold douche recommended by French writers, notably by Brierre de Boismont and others, require special attention. Brierre de Boismont says that by them "all forms of insanity, and mania in particular, may (often) be

cured within one or two weeks." He recommends that their temperature be between 75° and 85° F., and that the patient be kept in them eleven or twelve hours at a time, even extending this in some cases to eighteen hours. Notwithstanding the high authority recommending this practice, and the fact that it is mentioned without criticism by some recent authors, it is not one that ought, in my opinion, to be often followed, and the objections of Bucknill and Tuke are valid and amply justified. There is no doubt of the effectiveness of these prolonged baths in many cases of mania, but there are decided inconveniences in their employment, and some serious dangers that cannot be always foreseen. It will probably be found easier, safer, and equally advantageous in the great majority of cases to employ other methods of treating excited patients. The occasional use of slightly warm or tepid baths of an hour or even longer may, however, in some cases give excellent results and possibly succeed where other measures have failed.

Massage, or systematic friction, kneading, etc., so as to give thorough passive exercise to the muscles and quicken the circulation and stimulate the functions of the bodily organs, is by itself frequently of decided advantage in many depressed conditions of mental disorder. In excited or in ordinary demented conditions or in delusional insanity it is not specially indicated, and if employed may even do harm. I have seen the best effects from its employment in cases of mild melancholia with considerable bodily weakness and inactivity; and in these it seems sometimes to exert a directly favorable influence on the mental state. The physical symptoms, however, are the main indications to be followed in determining whether it is to be used, and its effects on the mental condition should be watched. In cases of extreme depression it is hardly likely to do good, especially if there is any tendency to agitation; its greatest value is probably to be found in the milder neurasthenic types of mental disease, and probably in stuporous insanity.

Electricity is an agent from which very much has been expected in the treatment of insanity, and in regard to which there is considerable difference of opinion. Some writers have claimed very remarkable results from its use, such as the cure of cases of many years' standing by cerebral galvanization, while others find it of very limited applicability in any form of mental disorder. There are, however, one or two points in regard to its employment in these cases that may be considered as established: one of these is the tonic action of what has been named general faradization, and another is the soothing and almost hypnotic action of a modification of the same process in some slightly irritable cases of the neurasthenic type. The regular way of employing general faradization is to apply one broad moist electrode to

the feet or buttocks, and to pass the other generally and systematically over the skin of the other portions of the body. To obtain the best effects from this procedure it is not necessary that every part of the body should come under the electrode, but the application should be rather general. If for any reason this is impracticable or inconvenient, very good results may be often obtained by passing the current through the body steadily for ten to twenty minutes from the back of the neck to the feet. This is practically a simpler form of general faradization, and I have found it very useful in a number of patients who suffered from sleeplessness from irritability and physical weakness. The current in general faradization should be rather finely interrupted and unirritating, and its strength should be only such as is easily and pleasantly borne by the patient. The action of the faradic current thus applied is more superficial and general than by other methods, and it is therefore safer as a rule than the deeper-acting galvanic current. The latter has generally been employed in insanity in the form of cerebral galvanization, in which the current is passed through the head either anteroposteriorly or transversely. The action of the galvanic current on the brain appears to be to reduce the calibre of the blood-vessels and to be soothing and hypnotic. It would seem therefore best adapted to congestive conditions, but the impossibility of always correctly diagnosing the conditions within the brain, as well as the somewhat uncertain and yet powerful action of the current on the brain, should make us cautious in its employment. If used, the applications should be of short duration, the electrode if applied to the head should not be too small and be well moistened, and the current should be a minimal one at the begining, and if increased at all it should be very cautiously and gradually. A current-graduator and milliampèremeter are desirable accessories in any case where galvanization of the head is employed.

Of late years much has been written and reported in regard to the use of hypnotism as a therapeutic agent, and some apparently extravagant claims have been made of its efficacy in mental disorders. It is probable that in many of the cases enough time has not been taken to ascertain whether the effects were permanent, and that the alleged cures or ameliorations were not merely the temporary changes that often occur under any unusual stimulus or excitation. The fact, too, that it has been found of most benefit in patients in whose insanity there existed a more or less pronounced hysterical tendency, as is very often the case in all forms, and especially in epileptics, also points this way. The changes thus brought about may nevertheless be permanent; and, accepting only this view of hypnotism as a therapeutic agent, it is not to be altogether neglected. The great practical difficulty in utilizing it is the fact that the vast majority of the insane

are less susceptible to hypnotization by the ordinary methods employed than are normal individuals; they lack the power of abstraction from surroundings or are more incapable of fixed attention; and when it is successfully induced the trance state is often less deep and permanent, and they are less open to suggestions than are the sane under the same conditions. At best its utility is a very limited one.

From hypnotism to the moral treatment of insanity is a natural transition in many respects. The latter, however, is a very extensive subject which cannot be fully treated of within the limits of this article, and I can only briefly touch on a few important points. In the first place, individual treatment—by which is meant the proper adaptation of all conduct and measures to the special needs of each particular case—is essential in the psychical management of the insane: a great deal depends upon the tact and skilled judgment of the physician and others to whom their case is entrusted. It is difficult, for this reason, to lay down rules of conduct to insane patients, as these will have to vary more or less according to the conditions of each individual case. In a general way, it may be said that the more nearly we can treat the insane as rational beings the better—not ignoring their insanity, but considering it as a physical disease, in the treatment of which one should, as far as possible, secure their personal co-operation. The majority of the insane have more or less an idea of the opinion of others as to their mental condition, and will have no less respect for one who, while understanding their ailment, nevertheless shows in all ways a kindly consideration and recognition of whatever good judgment and self-control they may possess.

It has been said that acute insanity in its early stages is not amenable to moral treatment. In its fullest sense this statement is not correct, for there are few conditions of insanity, hardly excepting even epileptic furor, that are not to some extent susceptible to moral control—a fact that is daily demonstrated in every well-managed asylum. It is true, however, that it is in the later stages and in the less violent types that psychic treatment comes most largely into play, including under this term everything that can be employed to influence the disease favorably through the action of the mind on the body. In patients in whom no bodily symptoms can be found to be treated, who are in nearly as perfect physical health as is the fortunate lot of healthy sane individuals, moral treatment is naturally the only resource. As the most important and most universally applicable method we may class rational occupation. There is nothing that can be found that is more practicable or more beneficial in the vast majority of cases of non-acute mental disorder.

Something must be said in regard to artifice or deception and to discipline in the management of the insane. The first of these is so

generally practised by the laity in their dealings with these unfortunates that it is hard to assume conditions where it is really required to be employed by the skilled physician who has anything in the way of assistance to carry out his necessary orders. Perfect frankness is not always advisable, but deliberate deception is, to say the least, very rarely useful, and is apt to be disadvantageous to those who use it, especially in any long-continued intercourse with the patient deceived. As a general rule, it is well to impress the fact of the reliability, if not of the invariable sincerity, of the physician upon the patient's mind.

Some writers have reported remarkable results from surgical treatment of insanity, especially gynecological operations. The insane woman has the same right as any other to be relieved of her ailments, and what has been said in regard to looking for every possible cause of the mental disorder applies here. As regards mutilating operations or any that may have an important bearing on the future life or functions, there are some embarrassments; insane women cannot be considered as responsible consenting parties. It is, moreover, we believe, the opinion of the majority of experienced alienists that too much must not be expected in the way of permanent benefit from gynecological operations in spite of the testimonies in their favor.

Treatment of the Different Forms of Insanity.

The special treatment of the different forms of insanity can, for the most part, be passed over rather rapidly, as the main points of their management have been already stated in the preceding pages. Only one or two forms will require any extended mention.

Acute exhaustional and toxic insanities of all forms require to be treated on hospital principles—that is by rest in bed, careful watching, and close medical attention to all special symptoms, as well as along the general lines above indicated. This is also true, to some extent, in the degenerative forms of acute mania, recurrent and circular insanity. So far as the symptoms of exhaustion or toxæmia exist, the rest treatment is indicated. This of course does not exclude exercise or out-of-door life when either is deemed necessary for a longer or shorter time. In some cases of acute mania and more often in the excited stages of circular insanity the confinement to bed for even part of the day is not so advisable and may be impracticable.

Melancholia.—In melancholic conditions the general indications are—rest, quiet, special attention to the condition of the bowels and of the alimentary canal generally, good feeding (by the stomach-tube if necessary), the procurement of sufficient sleep, and, most particularly, watchfulness against suicidal or homicidal attempts. The direct medicinal agents to be employed are mostly hypnotics and tonics, but in agitated melan-

cholia and in all cases of the strongly neuralgic type with præcordial pain, etc., analgesics are indicated. The principal one of these, and one which has been considered as almost a specific, is opium, usually given in gradually increasing doses. The writer does not personally recommend this treatment of carrying the dose of opium to a large quantity taken daily as tolerance is obtained, but it has much authority in its favor. In melancholia with strong hysterical or hypochondriacal tendencies opium is not the best remedy, and is in my opinion contraindicated.

Attention to the condition of the bowels is, as has been already stated, of the utmost importance in melancholia—more so, indeed, than in any other form of insanity. I have in some cases seen decided improvement follow the use of copious regular daily injections carried on for a week or ten days at a time, and then intermitted for a while or discontinued. Some French authorities (Regis, Voisin, and others) have recommended and reported great benefit from thorough irrigation or washing out of the stomach, especially in the relief of the troublesome symptom of sitiophobia. They hold that in these cases there is a catarrhal gastric disorder, and to this is to be attributed, in great part, the mental disorder. Regis, indeed, advises, in addition, the use of disinfectants, and claims to have had excellent results from the employment in these stomach "lavages" of the insoluble antiseptics, such as naphthol, salicylic acid, etc., in suspension with mucilage and sugar. The suggestion is worth considering, and it is possible that much good may be accomplished by disinfection of the whole alimentary canal—the stomach by this method, and the bowels as suggested in the earlier part of this article.

Absolute rest in bed is useful in the early stages of many cases of melancholia, and is more applicable in this than in most other forms of insanity where it has been recommended. Its effects are in many of these cases directly curative, and it decidedly facilitates other treatment. Combined with systematic massage and a specially regulated diet, largely of milk, it forms the well-known Weir Mitchell rest-cure, which is particularly applicable to certain forms of neurasthenic mental depression, particularly in women.

Epileptic Insanity.—When the mental disorder is connected with or caused by epilepsy, so that it can properly be called epileptic insanity, the neurosis gives the indication for treatment, and in a very large majority of all these cases the bromides are indispensable. It is commonly held that epileptic insanity is a hopeless disease as regards recovery—this, I think, is an error—but there is no question whatever as to the possibility of its being greatly ameliorated and its most dangerous symptoms controlled to a very large extent; hence the importance of proper medical treatment. This is to be directed mainly

to the epilepsy, and for this the bromides are the principal dependence. I have not found it necessary, except in cases of extreme severity, to employ such large quantities of these drugs as are often recommended: from 1 to 1½ drachms daily of the potassium or sodium salts in three or four doses has usually been found sufficient. Sometimes a combination of the bromides of potassium and ammonium appears to have its advantages over the former used alone, as not producing the symptoms of bromism so readily. It is sometimes useful to intermit the bromides for a while, especially if symptoms of decided bromism are persistent.

Under the bromide treatment the epilepsy is ameliorated, and the maniacal or other insane symptoms which are usually connected with the attacks are lessened or avoided. In one instance, at least, under this treatment I have seen a once-dangerous epileptic apparently restored to perfect health, no symptom of the disease having shown itself for a number of years. Such cures are very rare, but there are more cases in which epileptic insanity does not recur, though the epilepsy still continues in a mitigated form.

Besides the principal bromide salts, there are no remedies of such special efficacy in epileptic insanity. Of course, whatever is of use in epilepsy is often of advantage, but nothing else is so generally reliable. In a few instances I have found that the bromides were not tolerated, especially in any quantity, because they had a tendency to aggravate the mental symptoms, and even to bring on the maniacal condition. Where this idiosyncrasy exists, other remedies, such as nitro-glycerin, are occasionally of value; but in some of these cases I have found that no special anti-epileptic treatment, other than care as to the diet and general physical condition, was of any particular advantage. Such patients are, however, quite exceptional, and in no way impair the general rule as to the importance of active medication in epileptic insanity.

Cases have been reported of epileptic insanity cured by operative surgical procedures. It is possible that an operation might be indicated and successful if the insanity depended upon an epilepsy due to a comparatively recent traumatism, but under other conditions it is at least doubtful; and in all cases sufficient time should be allowed to elapse before announcing a cure. In most epileptics—and this applies also to insane epileptics—anything that produces a strong physical and mental impression upon the patient may temporarily suspend or modify the symptoms and cause an apparent betterment or cure; and this should be taken into account in estimating recoveries from operative procedures. Out of quite a number of insane epileptics that I have known to have been trephined or otherwise operated upon for the disease, I cannot recall a single case of permanent recovery.

The diet in epileptic insanity needs careful attention, the more so

since many of the patients have inordinate appetites. It should not be too stimulating, and with robust patients it is a good practice to cut off most animal food and restrict them to a vegetable and milk diet. Stimulants of all kinds, even tea and coffee, are liable to do harm, and tobacco is often particularly hurtful. Alcoholic stimulants, even in their milder forms, should be positively prohibited.

Paretic Dementia.—Paretic dementia—or, as it has been commonly called, general paralysis—is another species of insanity that calls for some special mention as regards its medical treatment. It is probable that the great majority, if not quite all, cases of this disease, if all the facts could be fully ascertained, would be found to have had antecedent syphilis, and the relation between the two disorders is in such cases probably more than an accidental one. This is possibly the explanation of the fact that the iodides exercise a most beneficial effect in some cases of this disorder. It is a good plan to administer, in all cases of paresis when there is no decided reason to the contrary, moderate doses of iodide of potassium—8 to 15 grains—three times daily, combined with tonics if necessary, until the treatment is found useless or is in some way contraindicated. The earlier in the disease it can be given the better, but it is not infrequently of advantage in advanced stages of paresis. While a cure can hardly be expected, decided amelioration sometimes follows this medication, the symptoms improve, and long remissions occur. Marked temporary improvement has been reported also from hydrotherapy in this disease.

Powerful revulsives—blisters, setons, etc.—have been recommended, even carrying blistering of the scalp to the extent of producing necrosis of the cranial bones, but I cannot speak from favorable experience with such remedial measures. If they are employed, it is safe to say it should be with due caution and avoiding dangerous extremes.

Chronic Insanity.—The management of chronic insanity, except in the case of such harmless lunatics as can be cared for without any special medical oversight, falls more properly under the head of hospital or asylum treatment of the insane. Acute exacerbations, when they occur, can be treated according to the general principles already stated. A few special symptoms, such as troublesome sialorrhœa of certain old dements, othæmatoma, etc., are mostly met with in old or presumably hopeless stages of insanity, but this is not invariably the case. The salivation can be controlled, if necessary, by atropine, at least for a time, and it is possible that some good may follow minute punctures of the ear-tumor to relieve the pressure; but this will not ensure against deformity. These, with the vaso-motor disturbances of the extremities and elsewhere, the disorders of the bones, etc., in such patients, are only indications of central disease and a generally

depraved condition of the system, and any treatment specially directed to them can be hardly more than palliative.

One thing should be borne in mind in any case of chronic insanity when the bodily health keeps fair, and that is to watch for improvement in the mental condition. Sometimes, even in those cases that appear most unfavorable as regards the prospect of a cure, a happy change appears, and recoveries in these conditions have come under the observation of almost every alienist of long experience. No case of insanity in which we cannot with certainty diagnose irreparable organic disease of the brain is to be considered absolutely hopeless.

HOSPITAL TREATMENT OF INSANITY.

By EDWARD N. BRUSH, M. D.

The diagnosis of insanity being established, the question of treatment at once brings forward the important query, Where shall it be undertaken—at home or in a hospital?

For cases, the expense of whose care and treatment at home would be a burden too great to be borne by the family or friends, the decision is at once necessarily made in favor of hospital care, generally in some public institution. This burden, being thrown upon the shoulders of the public, should be assumed by the State, to remove the conduct of the institutions as far as possible from the machinations of petty politics. In some of our commonwealths the force of public sentiment is fortunately such that the insane under public care have been made wards of the State, and the institutions for their treatment are solely State institutions. In others, alas! the medical supervision of these institutions becomes a matter of party control, and is awarded to the "workers" in political contests or their friends.

It is a curious condition, and one upon which the philosopher might find ample food for reflection, that carefully guards the property of the lunatic, surrounding it with all the safeguards of the law, and permits his person to be relegated for care and treatment—save the mark!—to the lunatic annex of some county almshouse or to the more pretentious State asylum whose medical and nursing staffs change with the variations of political control.

For the independent the question is not so readily answered.

If home care is suggested, it implies in many instances converting the home into an asylum, and the members of the household into active or passive members of the nursing staff. In the majority of instances the patient must be isolated, and this implies a sacrifice of room and conveniences on the part of other members of the family which but few private residences will permit. The employment of at least two attendants is also necessitated, one for day and one for night nursing, and in violent or suicidal cases or in advanced general paralysis a larger corps will often be required. Should the members of the family, from motives of affection or for reasons of economy, assume the duties of nursing in whole or in part, they run risks which are

by no means light. The strain of constant attention and apprehension, the shock to the sensibilities which the acts or language of the patient are likely to impose, added to the burden to the affections already caused by the illness of the loved one, are dangers, by no means small, which the attending physician must carefully weigh before he advises such a course or even gives to it a tacit assent.

When the insanity is an expression of a neurotic heredity shared by other members of the family the physician should by no means permit them to attempt the care of the case, or to be brought in prolonged contact with it in any responsible relation. The authentic records of numerous cases of *folie à deux* or *folie communiquée* are warnings against such a course which should not be unheeded. Savage[1] says: "I have seen cases in which an insane brother has started insanity, hitherto unknown in the family, which passed from member to member till three or four had become insane."

There are undoubtedly cases for whom home treatment is suitable, and even desirable. These are those for whom speedy recovery is anticipated, certain cases of insanity following fever, and a few others. Home care, however, should not be undertaken without a systematic course being laid down: plenty of room, so that isolation can be secured without restricting too greatly the movements of the patient, and facilities for unrestricted out-of-door exercise. Few city homes afford these requisites.

Hospitals for the Insane.

Few general hospitals afford suitable accommodation for the insane, and such patients are, as a rule, declined. At such institutions as St. Luke's, London, La Charité, Berlin, and a few others special wards have been provided, and in these the general routine of treatment does not differ materially from that pursued in hospitals devoted solely to this class.

In large municipalities such an arrangement would afford a ready and convenient receptacle for acute cases, some of whom might remain under care in these wards until recovery, while the cases of prolonged duration could easily be transferred to special asylums, which should by preference be located in the country. Such an arrangement would be in line with suggestions which have been made from time to time for the establishment in large cities of special hospitals for the insane, with a visiting staff organized somewhat on the lines of a general hospital staff, and would afford excellent material for clinical teaching in insanity.

The crowding together of a large number of chronic insane with a few acute cases in a city—as is done at the Philadelphia Hospital, for

[1] *Insanity and Allied Neuroses*, p. 480.

example, and in a few other cities—has no excuse in economy, nor is it sustained by any ideas of proper and scientific treatment, to say nothing of questions of humanity.

The special-hospital idea has met little approval from those best qualified to judge. A visiting staff cannot, from the very nature of their duties, become so thoroughly conversant with the varying moods and conditions of their patients, nor can they so well study their physical conditions, no matter how well qualified as neurologists, ophthalmologists, gynæcologists, or general practitioners they may be, as can a thoroughly trained resident staff under direction of a qualified medical superintendent.

The medical care of the insane, as Dr. T. Clifford Allbutt well puts it, is much more than mere "bottle medicine." The general routine of administration, the nursing, the classification, the amusements, are all features in the daily life in hospitals for the insane which can be made to tell for good in the progress of the patient, often of more marked and lasting value than mere drugs, and are elements which a visiting staff cannot control and which the interns cannot administer.

Hospitals for the insane are in the United States of three classes: (*a*) public, (*b*) incorporated, (*c*) proprietary.

Public hospitals are State, county, and municipal. But few of the last exist, and these only in large cities. State hospitals, as a rule, deserve the title of hospital in some degree, for systematic and careful treatment is the rule in these institutions, except in those which are unfortunately under political control.

Taking the average population of these institutions, 10 per cent. would be a liberal estimate of the recoverable patients under detention at any one time. It is, therefore, evident that the chief function performed by them is as asylums rather than hospitals. A valuable suggestion has been made that in these large institutions a distinct hospital structure be constructed, to remove the curable few from the many who simply need custodial care, that the distinctive medical work of the institution may be concentrated upon these cases. The institution which puts such a plan into operation will undoubtedly reap a rich reward of recoveries. Such hospital blocks are now in use in connection with several American and foreign institutions for the insane.

County institutions are, as a rule, simply the annexes to almshouses, and are too commonly unfit places either for detention or treatment of the unfortunate insane. Happily, a few States, like New York and some other States, have determined to make all the insane under public care wards of the State and are abolishing county institutions.

Incorporated hospitals—the oldest example of which in this country is the Pennsylvania Hospital of Philadelphia, with its insane depart-

ment in West Philadelphia—are commonly institutions founded by public subscription or private munificence. They are under the control of boards of managers or trustees, and are medically directed by a physician-in-chief or medical superintendent, with a staff of assistant medical officers, all in residence, and usually of more permanent term of service than ordinary hospital residents or interns. These hospitals are intended for both pay and free cases, but do not, with rare exceptions, receive public patients, the free cases being commonly supported by vested funds or from the earnings of the institution.

These institutions have nothing to gain by prolonged detention of patients, as they are not money-making corporations; they are managed upon some established tried principle which does not change with changes either in management or medical direction, and their medical officers are, as a rule, men of established reputation who have been selected to promote the best interests of the inmates of the institutions over which they preside.

Institutions of this character afford to the unfortunate a home and a refuge undisturbed by the machinations of political tricksters and unshaken by the turmoil of party strife, and may therefore be selected by those seeking a secure and established home for the insane with every feeling of confidence in their permanency. In the older institutions of this kind patients can be found who have outlived every officer and manager connected with the institution at the time of their admission and every member of their immediate family—men and women who for fifty years and more have known no other home, and for many years no near family ties, whose friends have come to the close of life happy in the consciousness that their afflicted ones were secure in a home not liable to be broken up or changed.

Until within a few years proprietary asylums, so common in Great Britain, were comparatively rare in the United States. There are at present several of these in the older States. They are commonly situated near the larger cities, and draw their patients from the wealthier classes, who are able to pay for the special accommodations and greater seclusion which they offer. These institutions are usually conducted by medical men who have had special training in the care of the insane, are commonly restricted to the more quiet classes (though a few receive all classes of cases), and limit the number of patients received. They afford a home-like resort, being, as a rule, dwelling-houses which have been remodelled to suit the purposes of a small asylum, and, for recoverable cases, of probable short duration, not actively violent, are excellent places for treatment.

Commitment to Asylums.

Steps Necessary to Commitment and Confinement.—The jealousy with which the "liberty of the subject" is guarded in Great Britain has led to the enactment of very stringent measures governing the commitment and detention of those alleged to be insane, and in the United States the laws passed by many of the States have been based upon the English lunacy laws.

Insanity, unfortunately, takes from the individual the liberty of action, and in the majority of instances so perverts his judgment that he resists and resents all attempts to place him where his actions can be controlled and the most favorable circumstances taken advantage of to promote his recovery.

Voluntary Commitment.—For the foregoing reasons voluntary commitments to hospitals for the insane are not common, though most desirable as far as the patient is concerned, because he participates actively in the means put forth to his recovery, rather than, as in compulsory commitments, giving a sullen and unwilling assent to what he cannot prevent, or, what is too often the case, violently resenting the interference with his liberty. It is evident that in the great majority of instances voluntary commitments will only take place in the earlier, and hence more recoverable, stages of the disease, and that the time may come in many such cases when from the progress of the disease the patient is no longer in a state to give assent to his further detention. In those States where voluntary commitments are permitted the law provides for such emergencies, both for the protection of the individual and of the institution or hospital having him in charge. Voluntary commitments have, in my experience, been found in many instances to be very desirable, and no difficulties of any moment have been met in permitting such action even in cases of well-marked insanity.

Compulsory Commitment.—In the majority of cases of insanity the commitment to an institution for the insane and subsequent detention must be against the patient's will, and hence compulsory. Voluntary commitments are desirable when the patient sees, or can be made to see, that mental and physical rest is necessary, and such regular and carefully conducted treatment as cannot be secured at home. Failing this, the patient's neglect of treatment, the pursuit of such a course of life as tends to aggravate his malady, the presence of homicidal or suicidal tendencies, neglect of lay or medical advice and control, and the common inability of families to treat and control such cases at home, make compulsory commitment and detention in an asylum necessary.

Legal Procedure.—To secure this certain legal steps are required. In some States these are very simple, comprising a mere statement in

the form of a certificate from one or two physicians setting forth that the person for whom detention is sought is insane, and, in the case of a patient at public support, an order from some county, municipal, or other authority making the necessary provision for support. In cases admitted at private expense some, more or less formal, arrangement is made with the family or friends of the patient.

In a few States the formality of a jury trial is required, the patient must appear, and is formally "charged" with being insane, as if sickness were criminal, and testimony is adduced to support the charge. Should the patient have sufficient intelligence to do so, he may employ counsel, and a legal fight over the care and custody of a sick man is the consequence.

In New York State and in many others a certain duration of practice, from three to five years, is necessary before a physician can certify as to the insanity of a patient for purposes of commitment. The legal form of certificate in New York is very elaborate, and is modelled somewhat after the English form. The physician must state why he regards the patient insane, must specify his acts, language, and delusions if any, and distinguish between what is observed by himself and what is told him by others. The certificate, after being sworn to, must receive the approval of a judge, who may call for more evidence or may have the patient brought before him if in his opinion such a step is necessary.

While some physicians are inclined to find fault with the legal formalities necessary to commit a patient to a hospital for the insane, it should be recognized that the constitutional rights of the patient are such that he may not be deprived of his liberty "without due process of law or the judgment of his peers." This "due process" need not be cumbersome, however, and should be such as involves only such publicity as is absolutely necessary. The commitment should not be made either of public or private patients without a written judicial order or approval. This order or approval should be based upon medical certificates duly verified, for the whole question of the necessity of the committal is after all strictly a medical one.

By far greater risk is incurred of delaying the prompt commitment of acute cases of insanity, and thus jeopardizing their recovery, through the vexatious and complicated requirements of too stringent laws than of possible improper commitments under more lax measures.

Importance of Early Confinement and Treatment.—The ideal lunacy law would be one which would encourage and promote easy commitments, secure intelligent and frequent supervisory inspection of hospitals and asylums by officials interested more in the intelligent and scientific care of the insane than in routinism and the preparation of

dry statistical details made to conform to their particular standard, and assure means of appeal on the part of any patient considering himself unjustly detained, with the certainty of prompt and discriminating attention and judgment.

Sir James Cox, one of the Commissioners in Lunacy for Scotland, long ago said that the asylum of Scotland which presented the best statistics of recovery and the shortest average detention of the patients was in a district where commitments were easily made without too great formality of law.

Insanity is essentially a chronic disease. In the majority of cases no hard-and-fast line can be drawn showing the exact duration of the disease. Many cases put down as recent are really of the chronic class from the outset, the degenerative and hereditary types of slow development, without, in numerous instances, any marked exciting physical cause in the way of ill-health, overwork, etc. The physician in judging of these cases finds himself depending for data upon the untrained and unreliable judgment and observation of friends and relatives, who not infrequently conceal and deny the family neurotic taint and misstate other important and material points.

Notwithstanding the difficulty of collecting accurate statistical information, the common experience of physicians dealing with these cases points to the prime importance of early, systematic treatment. Enough perhaps has already been said on this point, but I cannot too forcibly impress it upon physicians that the golden moments for recovery are in the first few months in the history of the case.

At the New York State Hospital at Utica, of 4071 cases, but 11.19 per cent. recovered of those over a year's duration on admission, while 43.56 per cent. recovered of those of six months' duration and under. Eighty-one per cent. of all the recoveries were drawn from 53.69 per cent. of the admissions—viz., those of a year's duration and less when admitted. During the last eight years at the Sheppard and Enoch Pratt Hospital 93 per cent. of all the recoveries were from 47 per cent. of the admissions. Numerous opinions of men of large experience could be cited on this point, and page after page of statistical material, but the common experience of physicians in general practice will confirm what I have said as to insanity.

Hospital Routine and Construction.

Having, by the necessary legal steps, been committed to a hospital for the insane, the patient enters at once upon the routine of the institution.

In some large hospitals it is the practice to set aside a ward or sec-

tion for each sex as the receiving ward.[1] Here the most judicious and experienced nurses are on duty, and the new patient is carefully observed, and after a few days or a few weeks drawn off to some division of the hospital adapted to the peculiar features of the case.

On admission the medical superintendent or some other medical officer should make a careful examination of the papers accompanying the case to ascertain their legality and correctness. A careful examination of the patient should follow as a matter of course, the physical and mental symptoms being carefully observed and recorded. The state of all the organs should be ascertained, either on admission or as soon as possible thereafter. The history of the patient, as narrated by the person who accompanies him or by the friends, should be fully taken, and the patient's own statement at once if he is able to make one.

Many patients come to hospitals with a history of turbulence and violence at home, which, unless the medical officer admitting the case is on his guard, would induce him to put the patient in a ward devoted to excited patients at once. The moral effect of commitment to a hospital is often shown in these cases. For the first time perhaps in his career the patient finds that he is under control of others. Three or four men, possibly, have forcibly taken him from home and compelled him to go to the hospital. The shock in a measure arouses his self-control, and in many cases the first exercise of self-control is the first step in recovery. In such cases the benefits of a receiving ward are manifest. Kind, firm, quiet treatment, a little special attention for a few days, the services of one or two attendants to accompany the patient about the grounds of the hospital or in walks into the surrounding country, combined with medical treatment adapted to the peculiar features of the case, will often terminate in the transfer of the case, not to the excited, but to a more quiet, division, with gradual enlargement of liberty and a happy convalescence. The patient would probably recover if relegated to the companionship of patients, like himself, noisy and excited, but at the expense of a prolonged attack of mania. The course which I have detailed will not, unfortunately, always prevent such an attack, but much can often be done in the very early stages after admission which can only be worked out with time and patience and anxiety later in the case.

[1] The term "ward" is not used with the same significance as in general hospitals. In hospitals for the insane it is usually applied to a corridor having rooms on one or both sides, used as bed-rooms for patients. Commonly a large parlor or day-room is attached, and bath, lavatories, and closets. In many hospitals each division has its own dining-room, though in public institutions large associate dining-rooms are coming into favor. There are also connected with some of the wards or divisions, besides the single sleeping-rooms, associate dormitories, where the suicidal, epileptic, and other special cases are collected for convenient night supervision.

The patient who at home feels that he can lay aside restraint and do as he pleases, in an institution, among strangers, puts on "company manners" and restrains his excitability. If he is encouraged to keep up this self-control, and at the same time is kept free from undue excitement, is put on liberal diet, obtains sufficient sleep, and, if physically able, plenty of exercise in the open air in the company of one or more judicious attendants, the attack may be not infrequently cut short.

The same exercise of self-control is observed in melancholy patients, but not as frequently. They apparently drop their delusions and fears, appear calm, and act in a natural manner. Such cases, though occasionally they continue to do well, should be watched very carefully: the cheerfulness and calmness are often assumed to avert suspicion, and when larger liberty is gained the premeditated suicide is attempted.

Reference has already been made to the great preponderance in larger hospitals of chronic cases. That the few acute cases might receive the attention which they demanded, and which, it was feared, was diverted from them by the necessary attention to the chronic cases, the suggestion has been made to provide separate hospitals for them, the chronic patients being transferred, as they accumulated, to large institutions for that class. A better plan, and one which, as I have said, has been adopted in some institutions, would be to construct, in connection with the hospitals now in existence, small, well-equipped hospitals for the acute cases, and in these annexes concentrate and accentuate the medical work of the institution.

A mixed asylum can probably be more economically administered than one for acute cases alone. The workers on the farm, in the garden, and the shops are largely of the chronic class, and they can be availed of to assist in various operations of this kind, thus reducing to some extent the cost of support.

The disadvantages of large numbers, the depressing effect upon convalescent patients of the sight of so much that is hopeless, are somewhat over-estimated. A little care in classification, the removal from sight and hearing as far as possible of the noisy chronics, a judicious mixture of quiet, industrious chronic cases with acute cases for whom occupation is considered advisable, will more than counterbalance these assumed disadvantages.

The practice, which appears to be a growing one, of constructing in connection with large hospitals smaller buildings built more like an ordinary dwelling, meets many of the objections to mixed asylums, and affords an answer to the objections against large hospitals because of their "institutional" character. Some of the larger incorporated hospitals and a few State institutions have even established "annexes" at the seashore or in the country at convenient points, and are already reporting very gratifying results from their use.

In the matter of construction modern hospitals are happily, in many instances, departing from the older architectural styles with the long corridor and rooms on either side. The older institutions were modelled after the first asylums, which were in some instances the houses of religious orders seized and converted into asylums. The cloister- and cell-like arrangement of these earlier institutions is thus accounted for.

The construction of infirmaries for the feeble and paralytic, with well-lighted, large day-rooms, open fires, verandahs for exercise in the open air for those unable to take more extensive excursions, and the separation of the day-rooms from the night accommodations, is another advance which should be followed by all large hospitals.

Hospital Treatment.

General Management and Discipline.—Aside from the use of drugs, which in the majority of cases forms the smallest part of hospital treatment of the insane, the medical administration of a hospital of this character comprises everything that in any way affects the health, welfare, comfort, or happiness of the patients.

The chief medical officer should, under the guidance and control of the board of management, which have to do with financial questions and questions of hospital or public policy, have supreme authority. He must avail himself of all the resources of the establishment, and must therefore be able to command them. A well-equipped hospital has many and elaborate appurtenances which can be best administered by one man. He need not necessarily interfere in the matter of farming nor insist upon personally directing the purchases, but he must, to be successful, be able to say that the farm is subordinate to the hospital —that it must be so managed as to give occupation to the patients when desirable; and as to the purchases, he should have full authority to dictate as to the quality and quantity, especially in the matter of food. So also with the sanitary arrangements of the hospital. If he is a well-trained physician, he should be able to supervise and control the important departments of water-supply, sewerage and sewage-disposal, heating, and ventilation.

In the matter of subordinate employés, the medical staff must of necessity be selected by the superintendent, as in that way alone can a staff competent to carry out the scientific work designed by the physician-in-chief be selected. The governing body of the hospital, with the best intentions possible, cannot judge of the nature of this work or of the competence of the assistants to perform it. The attendants and nurses, if made responsible to any other head than the medical, become untrustworthy and insubordinate, and the patients suffer in consequence.

All these details seem to impose an enormous burden upon the medical superintendent, but in a well-organized hospital, with efficient subordinate heads of departments, they are but little felt, and help rather than interfere with the purely medical administration.

The established regimen and discipline of a hospital organized on the basis above enumerated are felt for good by the patient as soon as he comes under their influence. They tend to establish habit and automatism and the annihilation of self. He sees everything about him moving with system and regularity, obedient to one will, subservient to established laws and rules. He finds it more comfortable to fall into line and follow, rather than move in the erratic paths which fancy dictates, and gradually his delusions and impulses lose control and sane ideas gain the ascendency.

Important and fortunate as this tendency is in the earlier stage of the disease, it is equally important, as convalescence begins, to encourage the patient again to direct his own movements in a measure, and to cease leaning upon others. During this period gradually the liberty of the patient may be increased, until he finally feels that he is under no restraints whatever except those which his own returning good sense impose.

Occupation.—The question of occupation is, with physicians connected with hospitals for the insane, an ever-present one. With some it becomes a minor and subordinate element in hospital-life; with others it seems to be the predominating idea. Between these the golden mean is situated. Occupation is undoubtedly of very great importance in the treatment of the insane, but the idea of occupation which is satisfied by putting a row of twenty dements to picking hair or making fibre mats is as far short of the true aim of occupation as is the attempt to get labor out of cases of acute mania or melancholia already subject to exhaustive tissue change and waste—a misconception of its true value.

The benefits of occupation are manifold. Primarily, even the most simple and routine tasks keep the mind occupied, awaken new trains of thought and interest, and divert the patient from the delusions or hallucinations which harass and annoy him. Moreover, nearly all occupations, especially those of an out-door character, call for physical exertion, which patients in certain stages of insanity cannot be induced to put forth in any other way.

For the tired, overworked farmer or farm-laborer, who for years has been at the dull treadmill of daily toil, agricultural labor would not be indicated. Rather give to him tasks which awaken new ideas and open new fields for thought. On the contrary, the dwellers in towns —the clerk, the merchant, the lawyer—are to be encouraged to engage in farming and gardening, the care of flowers, the improvement of the

hospital lawn. Men with trades are too few in most asylums to permit the introduction of many industrial occupations in which they could be interested, but printing, light carpentering, wood-carving, etc. can with advantage be used as adjuvants of treatment. It should not, however, be lost sight of that these last are all in-door occupations, and that the trades of the patients engaged in them have possibly some disagreeable associations connected with their mental disturbance, and recreation and diversion should be ensured to those so occupied.

Cases of acute mania and of early paresis, if permitted, will often overwork because of too great ambition or some extravagant delusion of power or peculiar ability. Patients with melancholia will also, from a too sensitive conscience or a belief that they must earn their support, which they think is costing a fabulous sum, need watching lest they do themselves harm from overwork.

Occupation, aside from its remedial value, has a value in the general disciplinary conduct of a hospital, as it affords a channel into which the excessive activity and nervous energy of many restless chronic cases may be safely diverted.

Recreation.—Recreation in the treatment of insanity, as elsewhere, is to be distinguished from mere amusement. It should be something into which the patient can himself enter, which awakes his mental and physical activities, one or both, and which at the same time does not unduly excite or fatigue. For out-of-door recreation tennis, croquet, baseball, cricket, and similar games may be followed. Patients who for any reason cannot engage actively in these may be made passive participants in various ways, as umpires, score-keepers, etc. A tournament or a series of sports with a well-arranged programme, which may with advantage be announced for days in advance, and thus afford an interesting topic of discussion and arouse mental activity in healthy directions, can with great profit be introduced on occasions during the summer season.

For in-door recreation the task becomes more difficult, and commonly narrows itself down to the ordinary round games. The spelling-matches so popular in the country a few years since would seem to suggest at least one variation from the common routine.

Physical Culture.—The age is eminently one of physical culture, and fortunately the prevailing fashion has taken root in many of our asylums and hospitals for the insane. Aside from occupation—and possibly on a line with it—nothing could be of greater value than well-conducted, judiciously directed physical exercise. It has its physical, mental, and, according to the experiences at the Elmira Reformatory, its moral[1] influence for good.

[1] "Physical Training as a Means of Mental Improvement," by H. D. Wey, M. D., Elmira, N. Y., *American Journal of Insanity*, Jan., 1891.

No one who has seen the interest which can be aroused, in cases of chronic dementia even, by patient physical training, the use of dumb-bells, Indian clubs, and the wands, can doubt the value which may be derived from the same source in cases of melancholia and in the mental and physical inactivity, with deficient capillary circulation, and a tendency to obesity, marking a period which may thence tend to convalescence or dementia.

It has been remarked that many cases of melancholia and certain of so-called stuporous insanity, or insanity of the confusional type, are shallow breathers. They do not sufficiently oxygenate the blood. For these the dumb-bells, the clubs, or better still, in some cases, the chest-weights, set up deeper respiratory movements, improve the circulation, and aid in the elimination of waste and poisonous products which are active or concomitant causes of the mental disturbance.

Military drill of a modified type comes naturally under this head, and will be found of even more extensive applicability than gymnastic exercise, as patients who cannot be trusted in the gymnasium or who are difficult to control can be induced to go through the manual with a very fair degree of regularity. The drill not only acts as a form of exercise and a mental recreation, but it has its advantage in a disciplinary way if the drill-master is one who understands his work and his patients.

Amusements.—Amusements should not be lost sight of in the enumeration of the remedial measures to be brought into play in caring for the insane. The sane mind enjoys laying aside the cares and perplexities of the hour and being simply amused. In the theatre or opera the outside world is forgotten ; the mimic scene becomes real and supplants all else. Many institutions have distinct buildings devoted to purposes of amusement. Theatrical performances, concerts, negro minstrels, lectures, views shown by the stereopticon, constitute some of the means which may be brought into use. These are of undoubted value, and may with benefit be enjoyed by all classes of patients.

Baths, Massage, etc.—Approaching the more strictly medical measures which are to be employed in the care and treatment of the insane, baths and massage may be considered as of great importance, especially the former.

The proper application and the value of hydro-therapeutic measures in the treatment of the insane have too long been neglected in institutions. The earlier hydro-therapeutic measures, the shower- and plunge- or surprise-bath, too often used as a means of punishment or coercion, have happily gone out of use, at least after the methods and for the purposes for which they were formerly employed.

De Boismont long ago called attention to the value of prolonged baths in the excited stages of mania and melancholia, and a few desul-

tory attempts have been made—most of them without system—to utilize the Turkish bath in hospitals for the insane. Recently,[1] Dr. Robert Baker of the York Retreat has given the results of ten years' experience in the use of the Turkish bath in the institution for the insane of which he is superintendent. Dr. Jul. Morel, physician-in-chief of the Hospital for the Insane, Mons, Belgium, has also published a valuable contribution on hydro-therapy in mental maladies.[2]

When the patient has sufficient vigor the prolonged bath or the cold pack has undoubtedly sedative influences of great value. The very depressing, and indeed prostrating, effects of these measures renders it imperative that they should be employed solely under medical supervision.

In certain cases of insomnia, as I have elsewhere pointed out,[3] a warm bath, brisk friction, or massage, with the administration of hot beef-tea, hot gruel, or milk, will often prove of greater value than any of the hypnotic drugs. The same sedative and calming effect will be found to be of value in acute maniacal attacks and in the frenzied periods of melancholia, and occasionally in general paresis. In the latter condition the prolonged tepid or warm bath should be used with extreme caution. The patient must be carefully watched, no matter what his condition, during the bath, and on the first indication of flagging pulse, paleness, or faintness the bath must be discontinued. It is not to be inferred that the bath is to be continued until these effects are produced: the duration must depend upon the personal judgment of the physician and the effect desired.

Dr. Baker, in the article previously referred to, speaks of the Turkish bath as a curative and as a palliative agent. As a curative agent he finds it of use in the various forms of alcoholic insanity; in those cases of partial mental failure seen in men of middle or advanced life, usually of a gouty tendency; in melancholia with dry skin, disturbed hepatic functions, and impaired digestive power; and in puerperal insanity. As a palliative he finds it of value in soothing the irritability of epileptics, in calming the early excitement of general paralysis when carefully employed, and in the treatment of chronic insanity.

Not only is the Turkish bath of direct medical value, but it has its hygienic value in the increased cleanliness which it ensures—in the freedom from the unpleasant exhalations from the skin, so common in chronic dementia, which it produces.

A well-equipped bath-house, with arrangements for shower-, needle-, spray-, and plunge-baths, with a suitable swimming-pool, would be a valuable addition to the therapeutic armamentarium of any hospital

[1] *Journal of Mental Science*, July, 1889.
[2] *Bullétin de la Soc. de Méd. mentale de Belgique*, Dec., 1889.
[3] "Some Clinical Experiences with Insomnia," *The Practitioner*, Jan., 1889.

for the insane. It is a distinct sign of advance that these measures are being increasingly used in hospitals for the insane.

Massage and the Swedish movement-cure are of undoubted use in suitable cases. Disappointment has been expressed by some who hoped to find in massage a sovereign application, but in cases of insanity of the exhausted or neurasthenic type with deficient eliminative powers, poor circulation, and a tendency to constipation—a common evil among the insane—massage will be found to have a useful field of application.

The Swedish movements are applicable to the insane, but the benefit to be derived therefrom is doubtless to be found also in general gymnastic training. Swedish movements have the advantage that they can be used with some cases, especially women, who would not follow a regular gymnastic course.

Diet and Forced Feeding.—Insanity is, in very many instances, a condition accompanied by great physical exhaustion and by rapid tissue change and waste. Unfortunately, we understand too little of the nature of these changes, and are too ignorant of the precise relation and value of various aliments, to be able to prescribe a diet which shall be always suitable, or even applicable, to the varying cases that are presented for treatment at a hospital. The prime indication in many cases is to prepare the digestive tract to receive and digest the food which is prescribed. Constipation must be overcome, gastro-intestinal derangements corrected, various forms of dyspepsia or indigestion relieved, before much can be expected from food or medicine. The exercise, recreation, baths, etc. above referred to are here applicable and often of value. In many instances the mental disturbance is merely a symptom of exhausted vitality from insufficient food, complicated possibly by auto-intoxication. Often, cases are presented for treatment which, if the physician is not on his guard, will slip through his hands and die from pure exhaustion. For these, light, easily-assimilated food in small quantities and often repeated is indicated. In this way the amount of milk, animal broth, and predigested food which can be administered is remarkable.

The special dietetic indications arising in different cases do not differ from those met in similar conditions among patients who are not insane. In acute delirious mania, in melancholia with frenzy, and in some of the maniacal seizures incident to the aged the great importance of a liberal, persistent use of milk, eggs, animal broths, cannot be over-estimated.

Some patients from delusion, from fear of poison, from suicidal ideas, or for other reasons refuse food. In many, time, patience, and tact will often overcome the aversion to food, but too much time must not be lost, for occasionally these cases have abstained from eating for much longer periods than their friends are aware, or have deceived

them as to the quantity of food taken. Sometimes these patients will take food, if permitted to do so, by stealth; sometimes their aversion is to certain articles only or to articles cooked in a certain way. If, however, no inducement will persuade the patient to take food, resort must be had to artificial alimentation. Unless there are positive contraindications in the condition of that organ, stomach-feeding should be employed.

It is usually an easy matter to introduce a sufficient amount of food into the stomach. The nasal tube, made like an ordinary gum-elastic catheter, except that the fenestrum is replaced by a hole in the end, attached to a Davidson syringe from which the valves have been removed—or, better, to a syringe the bulb and tube of which are of one piece of rubber—forms a very convenient means of feeding. The tube, being carefully oiled, is filled with the liquid food to be used, grasped between the thumb and finger, and slowly passed along the floor of the nostril until the posterior wall of the pharynx is reached. Passing the tube slowly down, if the pressure is slightly relieved where it is grasped by the thumb and finger, a few drops of liquid will flow out and cause an instinctive act of swallowing, which may be taken advantage of to pass the tube down the œsophagus. The bulb of the syringe, which has already been filled in filling the nasal tube, may now be compressed, and if the vessel holding the food is raised the whole apparatus acts like a siphon and the food is passed into the stomach.

Some preference is expressed by physicians for the stomach-tube—the pump is never necessary—but in case of a struggle it is more difficult to introduce and much more liable to cause damage.

In case the stomach-tube is used, an ordinary tin or glass funnel placed in its open end, into which liquid food may be poured, will suffice. In removing the tube it should be tightly grasped, or, if a stomach-tube, the finger placed over the end, in order to prevent the food retained in the tube from passing into the trachea.

Accidents have happened in feeding in this way: the tube has been passed into the trachea and the tissues of the pharynx and larynx have been lacerated; but such occurrences could only be the result of undue violence and great carelessness.

The foods which may be administered in this way are necessarily limited, but a wider range is permitted than would at first glance be suggested. Milk, the animal broths, raw or very soft-boiled eggs, gruels of various kinds, potatoes rubbed up in milk, the beef and mutton powders, may all be made to pass through a No. 8 catheter used as a nasal tube. I have found some advantage in administering with mashed potatoes, oatmeal, etc. some malt extract of good diastatic properties. A small amount soon renders one or two potatoes suf-

ficiently liquid, with the addition of a little milk, to pass easily through the tube; and as the food does not receive the preliminary mixture with the patient's saliva, so essential to the proper digestion of starchy foods, the malt supplies in a measure the deficiency.

The various peptonized foods are in some measure available for artificial feeding.

Nutrient enemata must in some cases be resorted to, but among the insane are unsatisfactory. I have in a few cases found some benefit, as far as improved nutrition was concerned, from the use of defibrinated blood *per rectum* when desiring to give the stomach complete rest.

Among the insane, as with diet for the sick elsewhere, the food should be carefully prepared and presented in a tempting shape. The appetite must be coaxed in many ways, and every effort should be made to prevent slovenly or careless service. The house dietary of the hospital must be liberal and varied. An abundant supply of milk, eggs, and fresh vegetables should always be available. For epileptics and patients subject to convulsive seizures meat should be sparingly used.

Many of the insane bolt their food, and to these it should be given in a finely-divided state. The same should be done in all cases of advanced paresis and other paralytic affections involving the throat muscles. It is by no means uncommon where this precaution is neglected to hear of a paretic being suffocated by a large mass of meat lodging in the pharynx.

Special Features of Hospital Care.

Aside from the general routine of hospital care of the insane there are some special features which are demanded by a certain proportion of the cases. The suicidal, the homicidal, the paralytic, and the epileptic each demands special care appropriate to the peculiar circumstances of the case. All cases of mental depression may be suspected of having thought of suicide, and to the majority of melancholics it has presented itself as an easy and ready means of throwing off the burden which oppresses them. The most careful watching cannot be expected always to prevent suicides in hospitals for the insane, but those institutions which provide for the best special night-and-day observation of these cases are most free from accidents of this character.

The early morning hours are, with many melancholics, the most distressing. They awaken from a sound sleep unrefreshed, and indeed positively more fatigued than on retiring: and these are often the moments when suicide is attempted. Many patients have taken advantage of the hour of changing the night for the day attendants to accomplish the act.

This peculiar condition of "morning-tire," as Cowles[1] has called it,

[1] "The Mechanism of Insanity," *American Journal of Insanity*, Oct., 1891.

is familiar in other states of nervous disease, particularly those of a neurasthenic type, and deserves attention because of its practical bearing on the care of the insane, as well as of its indication in the line of medical treatment.

In large public asylums the suicidal cases are as far as possible grouped together for night supervision, usually occupying associate dormitories resembling the wards of a general hospital, thus being arranged for convenient constant supervision. Suicidal patients also attempt self-mutilation. They obey the scriptural injunction and pluck out the offending eye or cut off the offending hand. These cases demand the most vigilant care, as an apparently inoffensive pin or harmless bit of glass or crockery may do irreparable harm.

The homicidal cases are fortunately not so common, but they are to be found in all institutions. The cases just described are not infrequently homicidal as well as suicidal. These are they who destroy their families to remove them from imaginary impending disgrace, punishment, or want. These cases will also at times, so great is their desire to die, but so strong their prejudice against suicide, commit homicide, that they may be punished therefor by execution.

The more actively homicidal cases belong to the class having what the French term the delirium of persecution—patients who believe themselves subject to electrical currents, occult influences, etc., and who seek to take vengeance on their tormentors and rid themselves of torment.

Patients with hallucinations, especially auditory, not infrequently assault those about them, from whom they think opprobrious and insulting epithets proceed. Such cases demand special care suited to the features of each individual. Change of associates in a ward, change of occupation, removal from suggestive surroundings, will often prove sufficient. The occupation of such patients should be regulated with regard to this feature. I have known a homicidal patient to be perfectly freely trusted with agricultural implements of all kinds for whom a butcher's cleaver would be a dangerous implement, because he believed he must behead some one with a cleaver.

Epileptics in the curious state known as double consciousness, following a seizure, will sometimes make violent and dangerous assaults of which they subsequently have no recollection.

Homicidal patients should always be given separate and single sleeping apartments when possible, unless the suicidal propensity also exists, and then the physician must decide which seems the greater risk and act accordingly.

The care of paralytics will be suggested by the peculiar circumstances of the case. As has been already pointed out, some modern improvements in hospital construction, the erection of infirmary wards

where these cases can have special care, with opportunities for modified out-of-door exercise on broad and sheltered verandahs, have been made, which suggest an element in the care of these patients worth trying.

As a matter of principle, it is well to insist that bed-sores in such cases are never necessary, and it is remarkable how seldom they occur if care is exercised; but in advanced general paresis, for instance, it is sometimes impossible to prevent the occurrence of acute sloughs over the sacrum and trochanters. I have seen these sloughs occur when little or no pressure existed—on the anterior aspect of the thigh and upon the dorsum of the foot. These sloughs are analogous to the instances of Reynaud's disease sometimes observed in the insane.

The care of wet and filthy cases will tax the resources of the asylum physician, but until he tries he can never appreciate how much can be done by proper night care of such cases. Patience and a persistent trial of the plan of taking such patients up once or twice during the night and placing them on the commode will often change their habits in time to a remarkable extent. Frequently the soiling or wetting of the bed occurs regularly at a certain time of night; in such cases, the hour being ascertained, the patient should be taken up shortly before the expected period.

Paretics are subject to convulsive seizures, and they as well as epileptics should be under such close night observation as will prevent their turning on their faces in a convulsion unobserved, and being smothered by the pillow. In some institutions these patients are provided with a hair pillow or some similar arrangement, which does not exclude the air from the face buried in it as thoroughly as does a feather pillow. The only true safeguard is the presence of a night attendant.

Among the special features of hospital care should be mentioned the influence of the institution. The effect of cheerful surroundings, of decorated walls, light rooms, a pleasant outlook, flowers, books, pictures—in short, what may be termed the æsthetics of the patients' environment—are all for good. I have seen the entire character of a ward change, so far as the conduct of the patients was concerned, by the addition of a large sitting-room, the frescoing of the walls, and the introduction of homelike furniture, pictures, and books.

As Connolly has said, "Some unmanageable tempers, some violent or sullen patients, there must always be," and for such there must be provision made. Seclusion, the separation of a patient wholly from his fellows, too often means neglect. If the nurse feels that all that is necessary is to put a patient in a room and turn the key, such a resource will be often called into requisition. It is necessary often, and sometimes best, to seclude a patient temporarily, but continued seclusion is bad for the patient, and, unless the physician is on his guard, demor-

alizing to the ward discipline. When seclusion is necessary for a very violent patient in a condition of frenzy, a padded room is a very convenient and safe arrangement. Such rooms generally have their walls and floors padded with canvas-covered mattresses. In England and Scotland they are more commonly used than in the United States. A padded room soon becomes foul-smelling under the best of care, and other means of protecting the patient from injury can usually be found. The protection-sheet used in some of the New York State hospitals is a convenient, safe, and ready substitute, and has the additional advantage of securing rest in the horizontal position.

If the patient is not too violent, and is not inclined to make assaults on the attendants, it will generally be found that a little care and tact will enable him to have considerable liberty under the observation and in the presence of two or three attendants in a quarter of the hospital where he will not disturb others nor be disturbed by them.

The vexed question of mechanical restraint is a difficult one to treat in this connection. The almost total abolition of mechanical restraint is one of the achievements of modern hospital work, and a very gratifying one. Some medical superintendents, indeed, have gone to the extent of adopting, as a rule of practice, "Absolutely no mechanical restraint." I think the more conservative will agree with me that restraint is sometimes necessary and humane. The other resorts are seclusion, or manual restraint, which entails a struggle with one or more attendants.

The sentimental plea that patients rebel against canvas and leather, and are unduly irritated and excited by the very means intended to allay and control their violence and excitement, is undoubtedly well founded in almost all instances. On the other hand, intelligent patients have thanked me for the use of restraint apparatus rendered necessary by their frenzy or attempts at self-mutilation or destruction, remarking that they accepted the restraint of the inert canvas or leather when they would have resisted the manual restraint of nurses, no matter how kind, as an unwarrantable interference with their liberty.

Attendants should never be permitted to apply restraining apparatus: it should be as much a medical prescription as any preparation of the Pharmacopœia. They should be encouraged to believe that it is seldom necessary, and then only as a temporary expedient to be put aside as soon as possible. I once heard a medical superintendent epitomize the whole matter in one sentence in reply to the request of an attendant to be permitted to restrain a particularly violent patient: "I prefer you to use your brains, and you should place your ability on a higher plane than leather." Fortunately, restraint apparatus can be commonly made very simple and but little irksome, and usually tact and judgment will obviate its use.

To prevent self-mutilation or destruction, to retain surgical dressings, to control habits of self-abuse, restraint may sometimes be necessary. There are some occasions when it may be better to use it than to resort to other means, but its use should always be temporary and always under medical prescription. This last phrase covers the whole subject of the hospital care of the insane.

The care should always be under medical direction, and the medical director should always be ready to avail himself of all the therapeutic agents, whether elements of the materia medica or what have been termed moral agents, in the treatment of his patients. He should have a hospital suited to the demands of the day, cheerful, home-like. Recreation, occupation, amusement, baths, exercise,—all enter into the daily routine of hospital work, but none should be used in mere routine; each should be adapted as far as possible to the case in hand.

THE MODERN TREATMENT OF DISEASES OF THE SKIN.[1]

By HENRY W. STELWAGON, M. D.

Introductory Note.

Ointment Bases.—A few preliminary remarks as to the various ointment bases in common use will probably be of value to the general worker, and may be necessary for a clearer understanding of the remedial applications to be referred to in connection with individual diseases. The several ointment bases may be used more or less interchangeably, or they may be used in combination or mixture.

Lard—of good quality, fresh, properly prepared, and slightly benzoinated—is still a base for ointment which has not been supplanted.

Cold cream—unguentum aquæ rosæ—is an excellent base and may often be employed in place of lard, and is especially useful when a cooling effect is desired. Certain skins will admit of ointment applications only when made up with this latter base.

Petrolatum, or its variously named trade substitutes, has the great advantage of remaining free from rancidity, but it is not so softening as lard, or even cold cream, remaining more upon the surface as a thin coating; it is not agreeable, and may be even irritating, to some skins. An ointment made with petrolatum will sometimes disagree, whereas the same medicament incorporated in lard or cold cream or mixed with another base will have a favorable effect. It has, however, upon the whole, deservedly wide use in cutaneous medication, and is an especially cleanly base for ointments for the scalp.

[1] Many remedies and some methods which have found space in the advertising columns of current medical literature during the past few years will not be found in this chapter: some for the reason that experience has demonstrated their unworthiness, and some for the reason that as yet their claim to be considered valuable has not been conclusively shown. In the pages at disposal it has been deemed to the best interests of the reader that the treatment of the principal diseases—diseases in which there had been probably some changes or additions in the therapeutical managment—be here presented from my own point of view and experience, which necessarily has assimilated much that my colleagues in dermatological work have found valuable. In addition, a number of the rarer diseases not considered in the former volume are briefly described, with the object of making the presentation of the subject of cutaneous diseases, as reflected by the entire work, as complete as space will allow.

Wool-fat, under the names of lanolin, agnine, adeps lanæ, etc., is sometimes used with advantage. It takes up a great deal of water, is alleged to have special penetrating power, and to be grateful to most people. It is somewhat stiff and tenacious, and should have incorporated with it 25 to 50 per cent. of petrolatum or 10 to 20 per cent. of some bland oil, such as the oil of sweet almond. It is somewhat questionable whether there is any superiority in a base so compounded over simple lard, petrolatum, or cold cream mentioned above.

Ointments which are to contain a proportion of liquid should be made up with suet, simple cerate, or lanolin, either entirely or partly, depending upon the amount of liquid used; or white wax or spermaceti, one or two drachms to the ounce, could be added to the ordinary ointment-bases named.

In the following pages, when no special ointment base is mentioned it may be inferred that any of the first three named—lard, cold cream, or petrolatum—or a mixture of two or three—may be indifferently used, remembering that, when a penetrating effect is desired, lard or equal parts of lard and lanolin, or lanolin with a proportion of bland oil, should be prescribed; if mainly a protective action is sought, then petrolatum should constitute the greater or entire part of the base, with a proportion of wax or simple cerate to stiffen it if necessary; if a softening and cooling effect, then cold cream is the most efficient ointment-base, with or without an additional proportion of wax, according to circumstances. There are many other bases which may be used, but these several constitute the most valuable and are those commonly employed.

ACNE.

The modern treatment of acne places great stress, and very properly, upon the value of bodily exercise, especially out-door exercise, and careful attention to diet. All indigestible foods and stimulating drinks should be avoided; coffee and tea, especially the latter, if indulged in freely, often have an etiological influence. The bowels should be kept regular with salines or vegetable laxatives, preferably the former. The patient's general health is to be rigidly examined into, and any other disease or faulty condition corrected. In women inquiry should be made as to the menstrual function, and any irregularity be given attention. As the digestive system is mostly at fault, this should receive special consideration. There are no specifics in this disease. Exceptionally it would seem that arsenic is of benefit in the sluggish, papular variety. In cold, sluggish, indurated, and deep-

seated types, more commonly seen in strumous patients, no remedy is comparable to small, continued doses of cod-liver oil. Ichthyol, which has been greatly extolled, in doses of 3 to 15 drops three times daily, has not been of service in my hands. Minute doses of bromide of arsenic, $\frac{1}{100}$ to $\frac{1}{50}$ grain three times daily, may be tried in obstinate cases. Small doses of corrosive sublimate and small doses of Donovan's solution seem to be of value in some cases in which sluggish, deep-seated suppurative action is pronounced.

Local treatment of acne is almost indispensable. The applications are usually made at night. Certain preliminary and concomitant procedures are, however, to be advised if a full effect of the local remedies is desired. The face should be gone over with a rubber-bulb cupping-glass ; this affords good massage, and tends to empty the gland ducts. The parts are to be washed thoroughly with soap and water, rinsed carefully, and sponged with hot water or steamed, and then to be rubbed dry. The blackheads, or the most conspicuous of them, should be pressed out by means of the finger-ends or an instrument made for this purpose. Subsequent to these several preliminary measures the remedial application is made. If this latter is in the form of a lotion, it is to be thoroughly applied, so that if it contains a sediment a good deposit of the same will be left on the face. If the remedy has been incorporated in an ointment, a small quantity is placed on a piece of flannel and somewhat vigorously rubbed into the skin, afterward wiping off the excess. The application is to be allowed to remain on over night. In the morning the ordinary toilet washing is usually sufficient to remove what is left of the preceding night's medication. If the patient has decided to give himself over to treatment for a short rather than a longer time, the procedures of the night before may also be adopted in the morning. Ordinarily, however, patients prefer to dispense with morning applications. If after a few nights' use of the selected method a slight degree of irritation has been brought about, a mild dusting-powder of boric acid may be used after the toilet washing in the morning. If the irritation so produced should become very noticeable, or a branny exfoliation of the skin show itself, the treatment is to be discontinued for one or more nights and then resumed. In sluggish cases or in those cases desiring a rapid effect, instead of using a plain toilet soap the tincture of green soap may be substituted. If one remedy fails to bring about any improvement, or should the improvement cease, then another remedy is to be selected. Frequently a certain remedy or combination will benefit materially for a while, and its subsequent continued use fail. After substituting another remedy or combination for a time, recourse may often be had to the original treatment with again similarly favorable results. It is difficult to say in a given case

whether ointments or lotions will prove the more satisfactory method of treatment. Those having harsh and rather irritable skins will, as a rule, do better on ointments. The two methods, however, may often be usefully combined, first applying the lotion, allowing it to dry in, and then subsequently rubbing in the ointment; or they may be used on alternate nights.

The several external remedies most in vogue to-day are sulphur, resorcin, ichthyol, mercurials, and boric acid. Of these the most valuable by far is sulphur. It is used either in ointment form, 30 grains to 2 drachms to the ounce, or in the form of a wash. There are several sulphur washes which may be commended. One containing 2 or 3 drachms of sulphur, 10 to 20 grains each of camphor and tragacanth, and lime-water to make up four ounces—known as Kummerfeld's lotion—is often serviceable. Another with the same quantity of sulphur, and 4 drachms of ether and sufficient alcohol to make four ounces, is also a common prescription. By far the most valuable is a combination of zinc sulphate and potassium sulphuret, each $\frac{1}{2}$ to 2 drachms, to four ounces of water. Another of value is that known as Vleminckx's solution or liquor calcis sulphuratæ. This is to be used diluted with several parts of water, gradually lessening the proportion of water. Resorcin is employed preferably in solution of the strength of 5 to 30 grains to the ounce, alone or in a compound prescription, made of a saturated boric acid solution, with 5 to 30 grains of resorcin, and 5 to 10 grains of zinc sulphate and 3 to 10 minims of glycerin to each ounce. Ichthyol is of value in some cases; it is applied in aqueous solution or ointment, 5 to 25 per cent. strength. It may frequently be combined with sulphur in ointment form. Of the mercurials the oleate of mercury, corrosive sublimate, and calomel are the most valuable. Corrosive sublimate is prescribed as a lotion, $\frac{1}{2}$ to 2 or more grains to the ounce, and may often with advantage be added to the compound resorcin lotion already referred to. The oleate is used with an ointment base in 3 to 20 per cent. strength. Boric acid is extremely mild, but is useful in some cases. It is employed as a lotion, or more frequently the solution is used as the basis of a compound lotion. A lotion of this kind with 30 to 60 grains each of calamine and zinc oxide to the 4 ounces constitute an excellent application for actively inflammatory, hyperæmic, or irritable cases, and is also useful when active remedies are temporarily suspended. Weak lotions of formaldehyde are also occasionally of service, made up of 1 to 8 drachms of the commercial 40 per cent. solution to 4 ounces of water.

From time to time the pustules may be advantageously opened and the pus ejected, the duration of such lesions being much shortened in this way. A plan of treatment, somewhat harsh and tempo-

rarily disfiguring, but often strikingly beneficial, is that in which the skin is put slightly on the stretch and gone over somewhat roughly with a dull-edged curette. The tops of the lesions are in this manner scraped off and many of the blackheads forcibly expelled; hot-water applications should be immediately made to encourage the bleeding which usually follows. This procedure should be repeated once or twice weekly till the skin is brought into a favorable condition.

Faradic and galvanic electrization of the face is an adjunct of value in many cases.

Acne of the back is treated similarly to that of the face, the strongest applications being demanded.

ALOPECIA (BALDNESS, DEFLUVIUM CAPILLORUM).

The treatment of loss of hair varies somewhat with the cause of the affection. The alopecia or falling of the hair following the various systemic fevers and similar diseases will usually be followed by spontaneous recovery, or recover with applications of mildly stimulating lotions or ointments. The loss or thinning of hair occurring in the secondary stages of syphilis will usually be followed by a re-growth. In all cases of hair loss, however, the hereditary tendency of the family in this particular will exercise great influence upon the prognosis. In those cases in which the alopecia is a part or consequence of a long-continued or neglected seborrhœa, the removal of this latter disease will, as a rule, be followed by a new growth. In some of the cases the subsequent use of stimulating applications may become necessary before the hair shows a disposition to grow again.

There are certain constitutional remedies which have had more or less reputation in the treatment of simple uncomplicated cases. These are arsenic, sulphur, and pilocarpine. These are prescribed in moderate doses, and may be worth a trial in obstinate cases. Other internal treatment is sometimes advised, but only to meet any indications which should exist, such as general debility, anæmia, and the like. The most valuable external applications are sulphur ointment, resorcin lotions and ointment, quinine lotions, lotions containing the tincture of cantharides, and tincture of capsicum. The tar oils are among the most efficacious, but have a limited use owing to their odor. Naphthol, in the proportion of 20–60 grains to the ounce of ointment, is also a valuable stimulating application. The following are the several formulæ usually employed:

℞. Sulphur. præcip., ʒi–ʒij (4.0–8.0);
Acidi salicylici, gr. x (0.65);
Lanolin, ʒij (8.0);
Petrolati, q. s. ad ℥j (30.0).—M.

℞. Resorcin, gr. xl–lxxx (2.65–5.2);
Glycerin, ♏x–xx (0.65);
Aquæ, q. s. ad f℥iv (120.0).—M.

℞. Resorcin, gr. xl–lxxx (2.65–5.2);
Ol. ricini, ♏x–xl (0.65–2.5);
Alcoholis, q. s. ad f℥iv (120.0).—M.

℞. Resorcin, gr. xl–lxxx (2.65–5.2);
Quininæ, gr. xij–xx (0.8–1.3);
Ol. ricini, ♏x–xl (0.65–2.5);
Alcoholis, q. s. ad f℥iv (120.0).—M.

℞. Tinct. cantharidis, f℥ij–vj (8.0–24.0);
Tinct. capsici, f℥ss–j (15.0–30.0);
Ol. ricini, ♏x–xl (0.65–2.5);
Alcoholis, q. s. ad f℥iv (120.0).—M.

Oil of turpentine, weakened with several or more parts of a bland oil, is also serviceable. Crude petroleum is a good scalp stimulant, but is somewhat disagreeable to use.

These various applications should be thoroughly made, being well rubbed in. The friction employed is not without value. Indeed, systematic massage of the scalp is itself of great advantage in the treatment of this condition. Faradization and static electrization are also often of value.

During the period of active treatment shampooing will be more frequently necessary than at other times. The scalp should be shampooed, according to the necessities of the case, every one or two weeks; if the application is carefully made not much soiling takes place and a shampoo every two weeks will usually be found sufficient. For the shampoo, ordinary Castile soap, or one of the tar, sulphur, resorcin or naphthol medicated soaps, or the tincture of sapo viridis, may be used.

ALOPECIA AREATA.

Therapeutists differ somewhat as to the proper method of treatment of this disease, those viewing it as a parasitic disease relying upon external applications, and those looking upon it as a neurosis

placing great stress upon the indicated constitutional remedies. These latter writers, however, consider local stimulation of the involved areas also of considerable value. Inasmuch as the stimulants used are almost all active parasiticides, it would seem an advantage to the patient to have the benefit of both external and constitutional treatment.

The systemic remedies upon which stress may be placed are arsenic, strychnine, quinine, iron and the hypophosphites. Other general remedies are, however, to be prescribed if indicated by the patient's general condition. In short, the general health, especially as regards its nervous tone, should receive careful attention. Hypodermatic injections of pilocarpine, cautiously employed, into the affected part have in some instances given good results.

The external remedies which are in common use to-day are sulphur ointment, naphthol ointment, 1 or 2 drachms to the ounce, an ointment of oil of cade, 1 or 2 drachms to the ounce, and the oleate of mercury ointment, 5 to 20 per cent. strength. Chrysarobin is especially valuable, and is greatly in favor with those holding the parasitic view of the disease.

Of the liquid applications which are beneficial may be mentioned oil of turpentine, pure or weakened with a plain oil; oil of cade, pure or diluted with alcohol; tincture of cantharides. This last may be prescribed with an equal part of the oil of turpentine and oil of cade. Repeated paintings with tincture of iodine, or repeated blistering are both efficient, at times, in obstinate cases. Painting carefully with pure carbolic acid or trikresol, not more than four square inches at one time, will act well in some instances; it is repeated, if necessary, once or twice, at the end of which time if a re-growth of hair has not shown itself, it should give place to another plan of treatment. Galvanization and faradization of the affected areas may also be used as adjuvants in rebellious cases.

DARIER'S DISEASE.

Darier's disease, or keratosis follicularis, is a rare affection of the skin characterized by pin-head to pea-sized grayish, dark red or brownish-red hard papules, usually with a central horny sebaceous plug. If the plug is squeezed or pinched out a small pit-like depression is noticed. The lesions arise from the sebaceous or hair-follicles. Usually discrete, although close together, they may here and there aggregrate so closely as to form more or less solid, rough,

slightly or moderately scaly, warty patches. The progress of the disease is slow. In some cases papillomatous and more or less pedunculated growths are observed. The palms and soles when affected show more or less thickening, with at times punctate depressions.

It has been both affirmed and denied that the disease is a psorospermosis. An hereditary tendency has been noted in one or two instances.

Treatment has not been successful in permanently removing the disease. Palliation is afforded by the plans of treatment adopted in ichthyosis.

DERMATITIS HERPETIFORMIS.

The promise of a cure of this most obstinate disease cannot be too cautiously expressed; a favorable result of permanent character is unfortunately rare. It is always rebellious and often extremely variable even under active treatment. The kidneys should be carefully examined, and in fact the whole patient is to be rigidly investigated. The disorder is, apparently, in many cases due to a chronically depressed nerve vitality. In some cases, especially the grave and pustular and bullous cases, septic conditions may be the responsible factors. In others a variable glycosuria has been noted. On the constitutional management of these cases will depend the prospect of an eventual favorable termination. That the necessary co-operation upon the part of the patient is not always obtainable, or not for a sufficiently long period, will explain at least some of our failures in curing this disease. The diet should be full and nutritious, but unstimulating.

The general treatment is based almost entirely upon indications. Arsenic long continued will in some cases make a favorable impress upon the course of the disease. Quinine in large doses, especially if a malarial poison is suspected, will also act favorably in a few instances. An active purgative two or three times weekly with a saline, concurrently with general tonic treatment, will act surprisingly well at times in mitigating an attack and favorably influencing the course of the disease. Strychnine in large and continued dosage should always be tried. Small doses of nitro-glycerin will occasionally appear to have a favorable action for a time at least. Phosphorus cautiously administered is also another remedy to bear in mind in the treatment of this intractable affection. Among the most valuable tonics may be mentioned cod-liver oil, iron preparations, and hypophosphites. Re-

lief from business or worry of all kinds, and travel may be suggested in proper cases. Sleep-producing drugs, such as sulphonal, trional, phenacetin, and the bromides, are necessary in many cases, but should be avoided if possible, as the after-effects are often detrimental. Opiates are especially liable to aggravate the local irritation.

External treatment is always necessary in these cases, owing to the intensity of the subjective sensations of itching and burning. As a rule liquid applications are the most agreeable. The most efficient are those of carbolic acid, liquor carbonis detergens, boric acid, thymol, thiol, ichthyol, resorcin, and liquor picis alkalinus. Several of these applications are also employed in the treatment of pruritus, to which the reader is referred for formulæ and proportions. Ichthyol, and also thiol, may be used diluted with 10 to 20 parts of water. The lotion application may be supplemented with a dusting-powder of talc and zinc oxide, with or without an equal quantity of boric acid.

Mild alkaline baths, 2 or 3 ounces of sodium carbonate or bicarbonate to thirty gallons of water; baths of potassium sulphide, 1 to 2 ounces to the bath, prove useful in some cases.

Ointments, preferably of a mild character, often become necessary in the vesicular, bullous, and pustular cases; they are rarely satisfactory in the erythematous varieties. In the moist types Duhring speaks well of a sulphur ointment thoroughly rubbed in with sufficient friction to break down the lesions. It is a strong application and should be used cautiously at first. An ointment of the liquor carbonis detergens, 1 or 2 drachms to the ounce of simple cerate or prepared suet, is another application of value. An ointment of thymol, 5 to 30 grains to the ounce, and one made up with 10 grains of salicylic acid, 2 each of powdered starch and zinc oxide, and 10 grains of camphor, with sufficient petrolatum to make an ounce, are both eligible preparations in some instances. The conjoint use, in these latter cases, of one of the above lotions and a supplementary mild ointment, as in the treatment of eczema, is a method which sometimes gives temporary relief to the local distress.

DERMATITIS REPENS.

This is a rare condition, usually having its starting-point at the point of a slight injury, and spreading gradually by a superficial serous or sero-purulent undermining, leaving a red, oozing inflammatory surface resembling eczema rubrum. It is slow in its progress, and is usually seen about the upper extremities. The subjective symptoms are slight. The true nature of the disease is not known,

probably being at first neurotic with a subsequent parasitic infection. It is rebellious to treatment. Antiseptic remedies, such as boric acid, permanganate of potassium, resorcin, and the like have proved most effective. Crocker had a good result in one or two cases with the continuous application of lead lactate.

ECZEMA.

THERE are still conflicting views as to the management of eczema cases. There are those, fortunately a diminishing minority, who look upon eczematous eruptions, as indeed most skin-eruptions, as entirely independent of general or systemic conditions. Such consider the disease a purely local affection, and treat accordingly. That there are cases in which the causative element is seemingly purely local, and which are responsive to external medication, every one with a large experience must admit. By far, however, the majority of eczema cases, for a successful termination require careful supervision of the patient's general health. Each and every case demands investigation as to the condition of digestion, as to the action of the kidneys, of the liver, and as to the proper functional activity of the other organs. A neurasthenic state is not infrequently a factor of etiological importance. A general debilitated state is also a not infrequent causative element. The condition known as struma is also a predisposing influence in some instances. The gouty and rheumatic diathesis is seemingly responsible for the chronicity of not a few cases. Chronic catarrhal inflammation of the stomach and intestinal tract is a potent factor in many cases. It will be readily seen that the plan of constitutional treatment must be varied according to the suspected or assumed predisposing factor. In all cases indigestible articles of food should be interdicted and stimulants avoided.

As in the larger proportion of these cases the causes are found to be digestive, remedies such as strychnine, the bitter tonics, salines, and digestives, and the proper regulation of the diet are demanded. Anæmia is to be counteracted with such remedies as full doses of iron, manganese, arsenic, and occasionally minute doses of a mercurial. In anæmic cases, too, plenty of fresh meat should be allowed. Gouty conditions require the cautious use of colchicum, small doses of arsenic and the salicylates, along with the use of an alkaline mineral water taken freely. Rheumatic predisposition requires its special remedies, particularly the salicylates, along with occasional purgation, and plenty of water. Hot-air or vapor baths are at times useful in sluggish types; but should not be employed in acute or subacute varieties.

Neurasthenia must be combated with the usual treatment and methods. For the strumous diathesis cod-liver oil in moderate dosage is most valuable, and its use in many cases, especially in children, cannot be overestimated. In extensive cases the possible good effects of static electricity—insulation—should be borne in mind; the itching is often very materially lessened.

There remain to be mentioned several remedies which at times seem to exert a specific influence. Arsenic is probably the most important of this group, and yet its failures may be counted by scores and its favorable influence by single cases. It is a disappointing remedy when given for its alleged specific influence. In small doses, however, it may often be given with advantage for its tonic effect. If the remedy has any special value it is in cases of a sluggish scaly and papular type. In the persistent, rebellious cases of eczema in young children it occasionally proves of curative value, but especially in such patients should its administration be cautiously watched.

The oil of turpentine may also be tried, more particularly in extensive and inflammatory cases. While it is being administered, water should be taken freely, so as to inhibit or prevent any irritative influence upon the kidneys. The wine of antimony, in 5-minim doses three times daily, is also a remedy for the actively robust patient with the disease of an acute type. General galvanization and faradization, as well as the use of these currents directly to the diseased surface have had supporters. Such plans are time-consuming and frequently disappointing. Their possible good effects should, however, not be forgotten in the treatment of rebellious cases.

Before taking up the question of local treatment, a few remarks as to the use of water and soap, and to methods of application, particularly of ointments and washes: Water is not to be employed in acute eczema, and in most cases of subacute eczema as infrequently as possible. In fact, with few exceptions water is temporarily damaging in all cases of the disease. A little sweet oil or petrolatum may be used for cleansing purposes when desired. Occasionally, however, it will be necessary to employ soap and water for the sake of cleanliness, and also at times to remove the products of disease and any accumulation of the remedy. The soap, which should be a mild one, should be in scanty quantity, warm to hot water being employed, and then the parts thoroughly rinsed of all the soap, tapped dry with a soft towel or linen, and an ointment application immediately made. In cases in which the products of disease re-accumulate rapidly it may be necessary, for a time, to use soap and water every day or two. In cases of a sluggish type, with either crusting or scaling or simply considerable thickening, soap-and-water washings are sometimes used for therapeutic effect, and to thin down the outer skin so that the remedial

application may be brought in more immediate contact with the disease. For this purpose also, as will be subsequently mentioned, sapo viridis is sometimes employed in place of a milder soap.

The method of applying ointments to inflamed eczematous surfaces has much to do with securing favorable results. When possible the ointment for the acute and subacute disease should be spread upon patent lint or suitable fabric and applied as a plaster, bandaging on if necessary. It may need to be changed twice daily—always once daily. At the time of changing, the parts should be either washed if deemed advisable or gently wiped with a soft piece of linen and a little sweet oil or petrolatum. In some instances it is best merely to gently wipe the surface with a clean rag and then re-apply the ointment. If plaster-like application is not convenient, the ointment should be applied by gently smearing over the parts a thin film; this should be done two or more times daily. In the subacute and chronic cases, in addition to the above methods of application which may in some instances be considered advisable, the selected ointment is to be gently but thoroughly rubbed in, in the more sluggish cases using considerable vigor.

Washes or lotions, if free from sediment, may be applied with an atomizer, or a small quantity is poured out and is applied with a soft piece of linen or absorbent cotton. If the wash contain a sediment, the bottle should be well shaken, a small quantity poured into a small saucer as before, and applied in the same manner as just described. Another method of application when a more rapid effect is desired, and when circumstances permit, is to keep soft linen saturated with the prescribed lotion applied constantly, wetting it with fresh lotion from time to time as necessary.

The past ten years or so have seen many new external remedies introduced for which special value has been claimed in the treatment of this disease. Of these a few only have secured a permanent place in the therapeutical management of this disease. The belief in certain quarters in the parasitic origin has had no practical influence upon the external treatment. In fact, almost all the remedies heretofore and now used have possessed parasiticide properties. The principles of local management—mild and soothing protection, moderate stimulation, and active stimulation—of these troublesome cases should always be kept in view, and these principles are the keynotes to the treatment of to-day. For the acute disease, or for the acute type of the chronic disease, mild, soothing, astringent, and antiseptic applications should be employed. For the subacute type, whether the disease is of short or long duration, the same class of remedies will often prove curative; or more frequently it will be found necessary to have recourse to moderately stimulating remedies. For the chronic type—

sluggish type—whatever its duration, strong applications will usually be found necessary to bring about a result.

Among the milder remedies nothing is comparable to a saturated boric acid solution used conjointly with a mild salve, such as the oxide-of-zinc ointment, cold cream, plain petrolatum, or one of these with a small proportion, 10 to 25 per cent., of lanolin. The same holds true of lotio nigra diluted with an equal part of lime-water, followed by one of the above salves. A very weak carbolic acid lotion, 1 to 3 grains of carbolic acid to the ounce, may be used in place of either of the above lotions. In the dry forms of the acute types a boric acid or a carbolic acid lotion, with a few minims of glycerin to the ounce, may often be used alone. Resorcin, 1 to 5 grains to the ounce, may be employed for the same purpose; so may also weak lotions of acetanilide. Diluted lead-water is also grateful in some cases. In addition to the several salves already mentioned as useful in the acute or inflammatory type may be mentioned the so-called salicylic acid paste, with, if the itching is intense, the addition of 5 to 10 grains of carbolic acid to the ounce:

℞. Acid salicylici, gr. x (0.65);
Amyli, ʒij (8.0);
Zinci oxidi, ʒij (8.0);
Petrolati, ℥ss (15.0).—M.

℞. Calaminæ, ʒj (4.0);
Ungt. zinci oxidi, ʒvij (28.0).—M.

℞. Liq. plumbi subacetat. dilut., fʒss–j (2.0–4.0);
Ungt. zinci oxidi, ʒiij (12.0);
Lanolin, q. s. ad ℥j (30.0).—M.

℞. Acetanilid., vel aristol, vel bismuthi subgallat., gr. v–xx (0.3–1.3);
Ungt. zinci oxidi,
Ungt. aquæ rosæ, āā. ℥ss (15.0).—M.

Lotions which are of special value besides those already mentioned are:

℞. Zinci oxidi,
Calaminæ, āā ʒj (4.0);
Glycerini, ʒss (2.0);
Aquæ, ℥vj (180.0).—M.

℞. Thymolis, gr. vj (0.4):
Sodii borat., gr. ij (0.1);
Acidi borici, ʒiss (6.0);
Liquor. calcis,
Aquæ, āā. fʒiij (90.0).—M.

Liquor carbonis detergens, 10 to 60 drops to a small teacupful of water, dilute lead-water, weak solutions of zinc sulphate ($\frac{1}{4}$ to 1 grain to the ounce), and similar mild astringent remedies, are also useful.

Coming into the domain of the treatment of cases of the subacute or mildly inflammatory type, a little more freedom as to the use of stronger applications is permissible. It is, however, a good rule to begin the treatment of all such cases with the mildest kind of remedies, and then gradually increase the strength of applications. The remedies already enumerated are employed also in this type, at first preferably of the strength already indicated, and then if there is no response, or improvement hesitates, increasing the proportion of the active ingredient. This list may, however, be considerably added to. The various mercurials, in ointment form, more especially calomel, white and red precipitate, oleate of mercury, of from 1 to 5 per cent. strength, are often extremely useful. Resorcin, 5 to 30 grains to the ounce of ointment; alumnol, 20 to 30 grains to the ounce; acetanilide, 10 to 30 grains to the ounce; aristol, about the same proportion; tar ointment 1 part, simple ointment or oxide-of-zinc ointment 7 parts, liquor carbonis detergens, one-half to one drachm to the ounce of ointment, oil of cade in the same proportion, sulphur 3 to 30 grains to the ounce, may be used in this type, occasionally with striking advantage.

Coming to the treatment of the sluggish type of the disease, much stronger preparations may have to be called upon. The strength of those already named may be cautiously increased. In addition to these, however, may be mentioned, an ointment of pyrogallic acid, 5 to 40 grains to the ounce; an ointment of chrysarobin, of the same strength; an ointment of liquor picis alkalinus, $\frac{1}{2}$ to 2 drachms to the ounce; strong salicylic acid ointments, 5 to 15 per cent. strength. Paintings with salicylated collodion, 10 to 40 grains to the ounce, or the painting on of a gelatin film similarly medicated, or the application of the remedy in the form of a rubber or gutta-percha plaster, will be found variously useful. A vigorous shampoo with sapo viridis, followed by a mild or moderately strong ointment application, is also valuable in thickened, sluggish types. In the latter type the salicylic acid rubber or gutta-percha plaster, 5 to 25 per cent. may often be used temporarily. Shampooing with sapo viridis and allowing the lather to remain on a few hours or longer and then following with an ointment may also be tried in the same class of cases. Frequently these stronger applications are to be used to bring the thickened patch into active irritation, the subsequent application being mild to moderately strong; the result of this method is often satisfactory. In the chronic types the tarry applications still occupy a conspicuous place;

they should always, however, be used cautiously at first, as certain skins are intolerant.

For the subacute and sluggish types of eczema of the leg, especially of the dry varieties, a gelatin dressing, consisting of 2 parts of gelatin, 3 parts of glycerin, 1 part of zinc oxide, and 4 to 6 parts of water, with the addition of 2 per cent. of ichthyol, constitutes a valuable method of treatment. The gelatin compound is melted over a water-bath, the parts well coated with it, and before completely dry a thin cheese-cloth or gauze bandage put on. The dressing may remain on for from three to six days, and is then removed with warm water, and a fresh one reapplied.

Another fixed or drying dressing for smaller areas, which may be used in cold weather, and which may be variously medicated, is one consisting of 2 parts of zinc oxide, 1 part of glycerin, and 4 to 8 parts of mucilage of acacia.

In the above *résumé* of the methods in ordinary use to-day in the treatment of eczema, nothing has been said as to the treatment of the disease as it occurs on the various regions of the body. This is for two reasons: one being that regional eczema has received extended consideration in the original publication, to which the reader is referred, and the other the fact that the principles of treatment and the remedies employed are the same whatever the part affected. Both circumstances and region affected, it is true, have some influence on the remedies selected, especially as to strength, and on the method or manner of application, but only such changes or modifications as will readily suggest themselves.

ECZEMA SEBORRHOICUM.

Under this head, as remarked in speaking of seborrhœa, there has been a tendency to relegate all cases of this latter disease, also some cases which have heretofore been considered rather anomalous psoriatic cases, and some cases of eczema. The cases from these two latter diseases are those in which there is a decided greasy character to the crusts and scales and a tendency to form segments or ring-like patches. The treatment here considered will refer to all the above cases except those cases of seborrhœa in which the inflammatory signs are, seemingly at least, absent. The most valuable remedies are sulphur, salicylic acid, resorcin, pyrogallic acid, and chrysarobin. The mercurials, especially calomel and the oleate, are also beneficial. Sulphur is employed in ointment in 1 to 10 per cent. strength; salicylic

acid, in ointment, 5 to 30 grains to the ounce; resorcin, in aqueous solution or in ointment, 5 to 30 grains to the ounce, as advised in seborrhœa. Pyrogallic acid is resorted to only in the more obstinate cases, using it as an ointment, 5 to 30 grains to the ounce. Chrysarobin is likewise employed in the rebellious cases, about the same strength as the pyrogallic acid. These stronger applications are exceptionally advisable in order that a moderate degree of inflammatory reaction may be brought about, the subsequent treatment being of a mild character; they should always be employed cautiously lest too great irritation be produced. My experience would indicate that the milder remedies are the more certain in results. This disease is looked upon as parasitic and contagious by those who have written most about the subject; but opinion is by no means yet uniform on this point, the observation of many with large experiences failing to support this belief.

As to constitutional treatment the strongest advocates of the entity of this disease place essential importance upon external treatment alone. It is advisable, however, to look into the general health of these patients. The effect of local treatment will certainly not be retarded, it will often be materially enhanced, by appropriate systemic medication, more particularly of a tonic nature, with the occasional use of saline laxatives.

EPITHELIOMA.

The milder types of epithelial degeneration only, as a rule, fall to the care of the dermatologist or general practitioner, and the treatment here outlined refers more especially to such cases. The superficial form of the disease (rodent ulcer), which more especially interests us, may exist for years and give rise to no alarm, but there is always the possibility of its assuming a more malignant phase, and therefore treatment is advisable in all cases. The object of treatment —the destruction or removal of the epitheliomatous or suspected tissue—must not be lost sight of. From incomplete removal or from independent degenerative action, more probably the former, recurrences are not uncommon. The removal of the diseased tissue may be brought about by the use of such caustics as potassium hydroxide, arsenical paste, pyrogallic acid, and the galvano-cautery, and also by means of the curette, and by excision. Various other caustics, as Vienna paste, zinc chloride, and the like, have also been used from time to time.

In superficial epitheliomata excision is rarely called for. A satis-

factory plan of treatment in many of the cases is by thorough curetting; this should be supplemented by momentary cauterization with potassium hydroxide or a strong solution of zinc chloride; if the former is used, its action should, after a minute or two, be neutralized by the application of vinegar or dilute acetic acid. If operative measures are objected to, or if for any reason they cannot be employed, resort must be had to the caustics. For the small superficial and recent lesion potassium hydroxide may be employed, either in strong solution or as the stick. After sufficient action has taken place vinegar or dilute acetic acid is to be applied as indicated. If the area of disease is somewhat large, or even in smaller lesions, a stiff ointment of pyrogallic acid may be used. A good formula is as follows:

℞. Acidi pyrogallici,	ʒij (8.0);
Emplast. resinæ,	ʒiss (6.0);
Cerat. resinæ,	ʒivss (18.0).—M.

This is to be spread on suitable material and closely applied; it is to be changed twice daily, each time washing the part with warm water, and gently removing as much slough as may have been produced—as much as can be removed by gently rubbing with cotton or a piece of cloth. This treatment is to be continued for from one to three weeks, ten days usually sufficing to produce sufficient destruction. At the end of this time the ointment is reduced to 10 grains of pyrogallic acid to the ounce, and healing is allowed to take place. At times, instead of rubbing off or trying to pick off the slough produced by the caustic ointment, this may be intermitted every few days, and poultices applied for several hours or more till the slough comes away. In many cases, if the area is not larger than a square inch, the application of an arsenical paste is an admirable method of treatment. The lesion should be freed from any crusting, and then a thick paste made of one part of arsenous acid, to one or two parts of powdered acacia, and sufficient water, thickly applied; over this is placed a piece of patent lint. The paste hardens and makes a firm and adhesive dressing. More or less severe pain is likely to be present in the course of a few hours, or half a day, accompanied with œdema and swelling. The application should be allowed to remain on for from twenty-four to forty-eight hours. If the destructive action has not been sufficient a second application of the same kind should be made; subsequently the part is poulticed till the slough comes away. The after-dressing or treatment of these cases depends somewhat upon the method of removal that has been employed. If this has been effected with the knife or the curette, ordinary antiseptic dressings are to be advised; if with potassic hydrate

or pyrogallic acid ointment or the arsenical paste, the same dressing may be employed, or an ointment of pyrogallic acid, from 1 to 2 per cent. strength, or simple resin cerate, with from 5 to 10 grains of carbolic acid to the ounce.

ERYTHRASMA.

This disease presents a symptomatology closely similar to that of tinea versicolor. The disease is, however, usually more or less confined to the folds, as at the axillæ, cruro-genital fold, and cleft of the nates; from these situations it is apt to extend to the immediate surrounding neighborhood. The eruption is not abundant as a rule, consisting of rounded or irregular, well-defined patches slightly furfuraceous, first somewhat pinkish or red, later of a yellowish or brownish tint. It is slow in its progress, lasting for years, and exhibiting no disposition to spontaneous disappearance. Slight itching may occasionally be present. It is due to a vegetable parasite, *microsporon minutissimum*. The therapeutic management is the same as that of tinea versicolor.

ERYTHEMA INDURATUM.

Erythema induratum, the *érythème induré scrofuleux* of Bazin, usually consists of one or several rather deep-seated nodules or circumscribed infiltrations occurring about the lower leg, especially in the calf region. The disease has also been observed upon the arms. The overlying skin may be at first normal in appearance or (as it usually becomes) of a livid hue. The process is slow, absorption taking place, or, as generally happens, the indurations gradually break down, resulting in a deep-seated, punched-out ulcer. The condition is not syphilitic, although the ulcers strongly suggest it. It is apparently tuberculous, being seen in strumous subjects, especially girls and young women. The disease is rebellious. The best plan of treatment consists in the applications of mildly stimulating antiseptic ointments and lotions, such as resorcin, boric acid, calomel, oleate of mercury, and aristol. A good method is to thoroughly cleanse out the ulcers with a solution of boric acid and resorcin, and then apply a mild ointment of resorcin, or aristol, or boric acid. In obstinate ulcers curetting may be resorted to. Rest, with the leg in the horizontal position, is more potent than drugs. The constitutional remedies to be prescribed are cod-liver oil and iron, with plenty of nutritious food.

HYDROA ÆSTIVALE (HYDROA VACCINIFORME; HYDROA PUERORUM; RECURRENT SUMMER ERUPTION).

This disease is seen in childhood and early youth, and is recurrent during the same and the following summers. The disposition disappears toward the age of manhood. The manifestation consists of vesicular lesions, somewhat vacciniform in appearance and almost invariably leaving scars. It is seen chiefly on exposed parts. The attacks usually come on after exposure to the sun and wind in the warm season. It first appears as red spots upon which single or several small vesicles develop, sometimes becoming sero-purulent and purulent, drying off gradually and leaving behind a depressed, small-pox-like scar. General symptoms of malaise, anorexia, and rheumatic pains and swellings may usher in the eruption. The attack runs its course, as a rule, in a few weeks. It has been observed almost exclusively in males. The nature of the disease is not known.

The treatment consists of the application of the mild antiseptic remedies which are employed in acute and subacute eczema. Exposure to sun and wind and even to great artificial heat should be avoided. Internally, arsenic and quinine have received the most favor.

HYPERIDROSIS.

The treatment of general hyperidrosis consists in removing or remedying the associated or underlying disease. Existing independently, the management is the same as that for the local forms. Of these latter—hyperidrosis of the hands, especially the palms, hyperidrosis of the feet, especially the soles, and hyperidrosis of the axillæ—that of the feet and soles comes most frequently for medical relief. In some of the cases, probably from a development of the *bacterium fœtidum*, the sweat becomes of an extremely fœtid odor (bromidrosis, osmidrosis).

Chief reliance is to be placed upon external applications, although any existing faulty condition in the general health is to be corrected. There are several systemic remedies, however, which are thought at times to have a specific influence, and which should, therefore, be prescribed in urgent or obstinate cases. These are ergot in full doses, strychnine, belladonna or its alkaloid, atropine, aromatic sulphuric acid, pilocarpine, and sulphur. This last is given in teaspoonful dose

morning and evening, and its laxative action limited, if necessary, by some mild astringent.

As to local treatment, dusting-powders are of value, the most efficacious have boric acid as a base, to which may be added either 2 to 6 per cent. of salicylic acid, 4 to 10 per cent. of acetaniled, or 10 to 15 per cent. of tannin or bismuth subnitrate.

The selected powder should, after a soap-and-water washing, be freely dusted over the parts and also into the socks or stockings. Cork inside soles should be worn, and should be washed daily in boric acid solution. Lotion of alum, zinc sulphate, tannin, 1 to 5 per cent. strength; a 1 to 2 per cent. alcoholic solution of quinine or acetanilide, tried alone or conjointly with one of the above dusting-powders, are also beneficial. Formaldehyde solutions, of strength just short of producing irritation, prove advantageous in some cases. In more obstinate cases strapping with soap-plaster will be found useful. Salicylated mutton suet, 2 per cent. strength, applied daily, is also valuable. In extreme cases of hyperidrosis or bromidrosis of the feet the continuous application of diachylon ointment or a 10 to 20 per cent. tannin ointment, changing twice daily for a period of two or three weeks, will frequently relieve and cure. In this latter method soap-washing should be for the time, except as a preliminary measure, avoided, the parts being wiped clean at each change of the ointment, with a soft towel and dusting powder. Finally, a trial may be made of faradization and galvanization of the affected parts.

LEPRA (LEPROSY; ELEPHANTIASIS GRÆCORUM; LEONTIASIS).

In the general mind leprosy has always been considered incurable, but there are recorded cases in which the disease was halted in its progress and also permanently relieved. This possibility should be recognized in every case, and proper and energetic measures persistently advised and carried out.

In the constitutional treatment, irrespective of remedies that may from time to time be indicated by accidental conditions, three drugs have gained considerable reputation as having special influence—strychnine, gurjun-oil, and chaulmoogra-oil. These should be tried in increasing doses. In addition to medication, hygienic measures are of great importance. The removal of the patient to a climate or country where the disease is not endemic or does not exist is a measure of great value. Benefit has also been reported from mercurial injections,

and likewise from injections of antivenene. Other drugs have been variously advised, but the three first named are those from which the most satisfactory results have been derived.

Externally, the oils mentioned, as well as ichthyol, pyrogallic acid, resorcin, and chrysarobin, have been extolled, applied usually in the form of an ointment in about the same strength as employed in psoriasis. It is generally recognized, however, that the external treatment is rarely more than palliative, and that it is to be employed or not according to the indications.

LICHEN PLANUS.

This disease is seen most frequently in those of nervous temperament and in the neurasthenic class. The constitutional remedies must be directed toward improving the general nutrition and an invigoration of the nervous energy. For this purpose the ordinary tonics, iron, quinine, strychnine, cod-liver oil, mercury, and arsenic are the available remedies. Arsenic, mercuric iodide, and iron are the most important, the first especially often exerting a specific curative influence. It should not, however, be administered in too large doses; it rarely benefits if no impression is made with 5-minim doses thrice daily. It may be given with advantage, especially if an excitable state of the nervous system exists, with the fluid extract of lupulin. Liberal diet should be permitted.

Local treatment is of great importance. The most valuable remedy in my experience is liquor carbonis detergens—a solution of coal-tar in the tincture of soap-bark. It may be prescribed in ointment, 1 or 2 drachms to the ounce of simple cerate or prepared suet; or it may be used as a wash, with several or more parts of water, increasing the strength, even up to the pure solution if irritation is not produced. Tar in other forms is also beneficial, but the coal-tar solution has not the same disadvantages for private practice that the other tarry preparations possess. An ointment of carbolic acid and thymol, of each 5 to 30 grains to the ounce, may also be employed with advantage. An ointment of carbolic acid 20 grains, corrosive sublimate $\frac{1}{2}$ to 1 grain, and oxide-of-zinc ointment 1 ounce, is largely used, although it has not been particularly serviceable in my hands. The carbolic acid washes and the zinc and calamine lotions mentioned in eczema are also of value.

In obstinate cases strong stimulating applications are necessary; for this purpose a mixture of equal parts of liquor carbonis detergens, tincture of green soap, and liquor calcis suphuratæ, may be tried, rub-

bing it in twice daily, and following with mild applications should active irritation result. In extreme cases bran and alkaline baths are serviceable and give relief to the burning and itching.

LICHEN SCROFULOSUS.

This is a rare affection of the skin seen in scrofulous subjects, and consists of small, mildly inflammatory papules tending to form irregular and crescentic groups. The papules vary in size from a pin-point to a pin-head, and are, when fully developed, of a yellowish red or fawn color. The older papules are usually capped with a minute scale. The lesions are slow in development and may remain for months; new lesions arise, and the disease is thus kept up almost indefinitely. After the typical eruption disappears, slightly yellowish spots remain. The trunk is the usual site for the disease. A few acne-like papules or pustules may be present. The pathological condition consists of cell-infiltration of the papillæ immediately surrounding the follicle. Treatment is always followed with favorable result. This consists of the administration of cod-liver oil and the application, by gently rubbing in, of a mildly or moderately stimulating application, such as a mild resorcin, or sulphur ointment.

LUPUS ERYTHEMATOSUS.

Lupus erythematosus is not only a stubborn and chronic disease, but it is often strikingly capricious. A patch may after weeks or months spontaneously disappear, new patches arising from time to time. The disease usually leaves behind a thinned or atrophic condition of the skin, but it is to be borne in mind that its disappearance may take place without a trace. This fact is not to be lost sight of in the medicinal management of the disease. In short, destructive or operative methods or any method which will leave scarring as a result should not be employed except in the persistent and rebellious disease, especially in those cases which show no tendency to spontaneous involution. There are two visible factors in a case of lupus erythematosus: one is the inflammatory or hyperæmic element, and the other is the cell-growth or infiltration. In the cases of the former class the mildest kind of application should at first be employed, gradually having recourse, should these fail, which they often do, to stronger remedies. In the conspicuous cell-growth or infiltration varieties or types a more stimulating plan of treatment may usually be prescribed from the start.

A few words first as to constitutional treatment: The true etiology of the disease is not known. It has been alleged that it is allied to lupus vulgaris in having the tubercle bacillus as the cause, and this view has been gaining considerable support in the past few years. The patient's general health should be investigated, and any needed remedies prescribed according to indications. There are several drugs which have, in some instances, seemed to exert some influence. These are cod-liver oil, the iodides (especially the iodide of starch), phosphorus, arsenic, salicin, and continued full doses of quinine. In some cases there seems to be some digestive or assimilative irregularity; in such, saline laxatives, along with stomachics and digestives with strychnine, at times make a favorable impression upon the activity of the disease.

Recurring to local treatment, among the most valuable mild applications may be mentioned—

℞. Zinci oxidi,
Calaminæ, āā. ʒj (4.0);
Zinci sulphat., gr. vj–xl (0.4–2.6);
Glycerini, ♏xx (1.3);
Aquæ, fʒiv (120.0).—M.

℞. Acidi borici, ʒj (4.0);
Resorcin, ʒss–ʒij (2.0–8.0);
Zinci sulphat., gr. xx–xl (1.3–2.6);
Aquæ, fʒiv (120.0).—M.

℞. Zinci sulphat.,
Potassii sulphuret, āā. ʒss–ij (2.0–8.0);
Aquæ, ʒiv (120.0).—M.

A method of treatment which is not without value in some cases is that which consist in nightly shampooing the affected parts with the tincture of green soap, rinsing, and following with one of the several lotions already named; or, if there is a good deal of irritation, following with some mild salve, such as cold cream or oxide-of-zinc ointment. If after a time the soap-washings are not followed by any cutaneous irritation, or should that be the case from the first, it may be followed with a stronger ointment application such as—

℞. Ungt. sulphur, ʒj–ij (4.0–8.0);
Ungt. aquæ rosæ, ʒvj (24.0).—M.

℞. Hydrarg. oleat. (20 per ct.) ʒij–iv (8.0–16.0);
Cerat. simplicis, ʒij (8.0);
Petrolati, q. s. ad ℥j (30.0).—M.

℞. Ol. cadini,	ʒj (4.0);
Cerat. simplicis,	℥j (30.0).—M.

℞. Aristol,	gr. xx–lx (1.3–2.0);
Petrolati,	℥j (30.0).—M.

Painting the parts with a medicated collodion:

℞. Acid. salicylici,	gr. x–xxx (0.65–2.0);
Zinci oxidi,	ʒss (2.0);
Calaminæ,	gr. x (0.65);
Collodii,	℥j (30.0).—M.

is sometimes of material advantage.

Among the stronger applications which may be used alone or in conjunction with ordinary toilet washing, or following the washing with the tincture of green soap, may be mentioned the oil of cade (pure), strong tar or sulphur ointment, an ointment of pyrogallic acid, 10 to 40 grains to the ounce, a strong calomel or white precipitate ointment, 40 to 80 grains to the ounce.

The stronger applications which may be required are a salicylated collodion, 20 to 60 grains to the ounce, collodion medicated with resorcin, 2 to 10 per cent. strength, beginning with the weaker. Pyrogallic acid may also be used cautiously in the same manner, 10 to 40 grains to the ounce. Painting the parts over with pure liquid carbolic acid, and repainting again a day after the crust thus formed has fallen off is valuable in some cases, although somewhat painful. The cautious application of arsenical paste or ointment, or the caustic pyrogallic acid ointment, referred to in the treatment of lupus vulgaris, may be used. Such strong applications should only be employed in obstinate and unyielding patches, as a variable amount of destructive action follows their use. Salicylic-acid-creasote gutta-percha plaster is of advantage in such cases, the destructive action being usually slight.

The operative plans may also be resorted to in this latter class of cases. Repeated linear scarification, as in lupus vulgaris, is much more applicable in this disease. If the patch is small, curetting, with subsequent slight cauterization, as in lupus vulgaris, is also a valuable method. The galvano-cautery may also be employed when destructive methods are deemed advisable.

LUPUS VULGARIS.

That lupus is due to the invasion of the cutaneous tissue by the tubercle bacillus is now almost universally admitted. Constitutional treatment is, therefore, relatively of little importance compared to local treatment. In some cases, however, certain constitutional remedies appear to have a favorable influence upon the progress of the disease, and to aid materially in maintaining the effect produced by local measures. Cod-liver oil in continued and moderate dosage is the most valuable of this class. The iodine and iron preparations are also of value in some instances. The treatment by hypodermic injections of tuberculin, 1 to 2 milligrammes at each injection, repeated at intervals of several days to a week, is a method that may be cautiously employed in extensive and obstinate cases; not alone, but conjointly with a thorough curetting or cauterization, or with other active plan of local treatment. It should not be used if there is a suspected dormant tuberculous deposit in the lungs or any other organ, and the proper antiseptic precautions are to be scrupulously observed.

Owing to the observation, now several times made, that an accidental erysipelas sometimes cures an existing lupus, the artificial production of this disease by inoculations of the products of benign erysipelas has occasionally been practised, but the method has been disappointing. The resort to such treatment would not be without positive danger, and would not be justifiable except in rare instances. It is of course understood that whatever plan of treatment is pursued, the patient is to be placed in the best condition of health possible, with plenty of fresh air, exercise, and nutritive food.

The plans of treatment of lupus most practised to-day are those in which operative measures figure largely. Before referring to the several operative methods in vogue, reference to the milder or non-operative plans occasionally adopted may be briefly mentioned. There are two elements to be considered in an average case of moderately advanced lupus: one is the inflammatory element, and the other the new cell-growth. The various soothing applications described in the treatment of acute and subacute eczema will in some instances have a material influence on the former and in this manner lessen the conspicuousness of the lesions. Actual improvement in the disease itself is exceptionally noticed even in this method of treatment; permanent improvement with such applications is, however, hardly to be anticipated. Stimulants, which for the most part are parasiticides, will in a few instances exert a favorable influence upon the course of the disease. Of the last class of remedies the mercurials are the most valuable. An ointment of the oleate of

mercury, 5 to 25 per cent. strength, or one of corrosive sublimate, ½ to 2 or more grains to the ounce, mercurial plaster, and corrosive sublimate lotions, ½ to 2 grains to the ounce, have all been of proved value in some cases.

As to the destructive methods of treatment one of two plans may be adopted, or they may be employed conjointly. The several caustic methods advised by different dermatologists to-day are: A gutta-percha plaster containing 10 to 25 per cent. salicylic acid and the same, or a greater quantity percentage, of creasote; an ointment of pyrogallic acid, 25 per cent. strength; arsenous acid, 10 grains, cinnabar, 20 grains, and simple ointment, half an ounce. These several caustic applications are kept constantly applied, a fresh application being made at least once daily. After a certain number of days, about ten days to three weeks, with pyrogallic acid ointment, about the same time with the salicylic acid combination, and after three or four days with the arsenical ointment, the treated parts are poulticed for twelve to twenty-four hours to remove the slough, and a mercurial ointment or plaster applied. Several repetitions of these caustic methods must often be made before complete recovery takes place; and in some cases the result is not very satisfactory. Other methods of cauterization are: with the actual cautery, the galvano-cautery, and the Paquelin cautery.

Of the operative methods the one most generally employed is that which consists of thoroughly curetting the diseased tissue. After this a mercurial plaster is applied, or what is certainly of greater value, pyrogallic acid ointment, already referred to, for several days, and subsequently the mercurial plaster. Linear scarification is another favored method—rather tedious, but with good cosmetic results. The part is thoroughly cross-hatched with a sharp bistoury, single or multiple, the incisions being close together; this is followed by mercurial plaster. At the end of two or three weeks the same procedure is again practised, and so on till the result justifies its discontinuance. Recurring isolated tubercles in the scar or at the edges of the original area may be treated by boring into them with a pointed stick of silver nitrate or with a dental burr; or the curette may be used for their removal.

GRANULOMA FUNGOIDES.

This disease has been described under various names, such as "mycosis fungoides," "inflammatory fungoid neoplasm," *lpmph-adénie cutanée*, "sarcomatosis generalis." The disease is insidious

and chronic, being slowly progressive, and with rare, and possibly questionable exceptions ending, after a variable number of years, fatally. It begins with symptoms of an eczematous, urticarial, and erysipelatous nature, which may be somewhat capricious and irregular and last for some weeks or years. Itching is apt to be a troublesome symptom. Later other symptoms are added; papular and tubercular and tumor-like elevations present themselves, of a pinkish or red color, some becoming ulcerative and fungoidal. These growths, which may be quite imposing in character and size, occasionally undergo resolution and disappear. New growths, however, make their appearance from time to time and may exist in profusion. Exceptionally the disease begins with the appearance of new growths. Finally, from gradual exhaustion and the supervention of septicæmic symptoms, the patient succumbs. The true nature of the disease is not known. It is presumably microbic. The few reported recoveries have resulted from the administration of arsenic, preferably by the hypodermic method. Otherwise treatment, both local and constitutional, is based upon general principles.

PITYRIASIS RUBRA PILARIS (*Devergie*).

This is a rare disease, characterized by a dry scaly follicular eruption, which may be somewhat limited or may become more or less general. In cases of the limited disease the most striking features are the follicular papules and moderate scaliness, variable infiltration or thickening, with a harshness and accentuation of the lines of the skin. In the extensive cases these same features obtain, usually in a more pronounced manner, and in some places the scaliness is so marked that the follicular character of the disease is not readily recognizable. In other parts of the body, especially about the back of the neck and in the flexures, the follicular and papular characters are so pronounced that such areas roughly resemble mild ichthyosis hystrix. Taken as a whole, the disease roughly presents features of psoriasis, keratosis pilaris, and ichthyosis. Inflammatory signs are practically absent or mild in character. The nature of the disease is not understood. Therapeutic measures are usually but palliative.

The treatment is essentially that of psoriasis, although arsenic, if used, is to be prescribed with caution, as it may make matters worse. Exciting the sweat-secretion with pilocarpine and warm baths should be a part of the treatment.

POMPHOLYX (CHEIRO-POMPHOLYX).

This disease is rather uncommon. It is characterized by a vesicular or bullous inflammation limited to the hands and feet, and may be sudden or gradual in development. A good deal of œdema and swelling, with pain, burning, and sometimes itching, are also observed. The lesions are, at first at least, somewhat deep-seated. A condition of hyperidrosis of the parts is sometimes seen as preceding and accompanying the disease. The hyperæmic element is usually slight, the affected parts often having a sodden appearance. The disease is observed in those of a nervous temperament who are depressed in health. It tends to recur at irregular intervals. The immediate attack usually subsides after a few weeks. Treatment is essentially that of acute eczema. The constitutional treatment is with active tonics, such as arsenic, iron, and strychnine.

PRURITUS.

Pruritus is sometimes met with in the course of certain organic and systemic diseases, sometimes as a symptom of a functional disorder, and sometimes apparently independently of any constitutional factor. In all cases a careful investigation must be made into all the possible etiological factors, the kidneys, liver, and digestive tract especially receiving attention. The constitutional treatment will therefore be directed toward removing any condition which may seem to have a predisposing influence. In many of the cases the digestive tract will be found at fault. Salines and antacids, especially the sodium salicylate and ammonium salicylate have an important place in the treatment. In the apparently causeless cases constitutional treatment is entirely empirical. Atrophine, potassium bromide, sulphonal, antipyrin, lithia salts, cannabis indica, gelsemium, pilocarpine, lupulin, ammonium valerianate, and similar drugs are variously prescribed, and sometimes with relief.

External treatment is always necessary for immediate effect. The most valuable applications are: a lotion of carbolic acid, 1 to 3 drachms, alcohol 1 ounce, and water to make a pint; a lotion of liquor carbonis detergens, 1 to 4 teaspoonfuls to the teacupful of water up to the pure solution; liquor picis alkalinus, 1 to 4 drachms to the pint of water, used cautiously; one of boric acid, 4 drachms, the same quantity of glycerin, a drachm of dilute hydrocyanic acid, and a pint of water.

In some instances, especially in some cases of senile pruritus when the skin is harsh and dry, oily or ointment applications are more beneficial. Benzoic acid, 10 to 30 grains to the ounce of petrolatum

and lanolin; menthol, 5 to 20 grains to the same ointment base, or in liquid petrolatum; an ointment of the same base with 10 to 30 grains each of camphor and chloral to the ounce; one of carbolic acid, 5 to 20 grains to the ounce, and similar remedies incorporated in salve form, will be found among the most satisfactory.

In the local forms of pruritus—pruritus scroti, pruritus ani, and pruritus vulvæ—the same applications will also be found useful. In addition to the above may be mentioned a solution of silver nitrate in spirits of nitrous ether, 5 to 10 grains to the ounce, painted carefully over the parts in pruritus scroti; the tincture of benzoin painted carefully over the parts in obstinate pruritus vulvæ; and cocaine and menthol lotions or ointments, 1 to 5 per cent. strength, in pruritus ani. In these local varieties sponging with hot water, as hot as can be borne, will often give temporary relief.

In pruritus hiemalis, that form of the disease which in some individuals makes its appearance as soon as cold, dry, and windy weather sets in, the above applications may be tried one after the other till relief is afforded; ointment applications are the more generally useful in this variety. In the pruritus immediately following a bath, which not a few persons suffer from, glycerin lotions, 1 or 2 teaspoonfuls to two tablespoonfuls of water, a mild ointment application such as petrolatum or cold cream, or a lotion of carbolic acid, will afford some relief. In some individuals thus affected the Turkish bath may be indulged in without the usual pruritic attack.

PSORIASIS.

It can scarcely be said that any great progress has been made in the treatment of psoriasis in the past ten years. The various remedies, both external and internal, which have been employed have, it is true, been weighed in the school of experience, and the result is the status of to-day. The medical treatment should have the full co-operation of the patient as to proper regulation of the diet, outdoor exercise, and the avoidance of stimulants.

As to diet it is difficult to state positively how much influence it has for good or bad, but it is known that foods which will lead to any disturbance of digestion or those which are of difficult digestion will have a varying unfavorable influence and tend to retard recovery. Over-eating and lack of compensating exercise will also influence the disease unfavorably. Occasionally patients are met with who will respond more rapidly to treatment when they have the aid of a largely vegetable diet; and on the contrary some cases will do well on just the opposite, almost a purely meat diet.

As to the constitutional medicinal treatment, that plan will be most frequently successful that takes a comprehensive view of both the patient himself and his skin-disease. Any existing irregularity in the general health must be looked after. The bowels are to be kept sufficiently free. In those cases in which debility is the predisposing factor—for instance, psoriasis occurring in women during the nursing period—suitable tonics are to be administered, especially the hypophosphites, cod-liver oil, and iron preparations. In those patients in whom there is a distinct gouty or rheumatic underlying cause, the alkalies, salicylates, salicin, colchicum, and other remedies of this class come into play. Salicin in full doses continued for some length of time sometimes proves of great value. Not a few patients with a psoriatic tendency will remain practically, or in great measure, free from cutaneous eruption so long as a proper tone of the digestion and the general health is maintained.

Irrespective of any recognized constitutional predisposing factors, certain remedies may be tried when a line of treatment based upon the above suggestions fails. The remedies of this class which have more or less of a recognized use to-day are arsenic, the alkalies, potassium iodide, tar, spirits of turpentine, wine of antimony, oil of copaiba, and thyroid gland. Of these arsenic stands first in value. It may, in fact, be said to exhibit a specific control of the disease in at least a fairly large proportion of the cases. Its value is shown most in the beginning attacks or in those cases, even if of long duration, in which the remedy has as yet not been systematically employed. In subsequent attacks its usefulness is not so well marked, and it frequently fails absolutely. Its action is usually unfavorable in the markedly acute spreading disease. In other cases it may be given along with other lines of treatment. The dose should rarely exceed ten drops of Fowler's solution three times daily or the equivalent of arsenous acid or the solution of sodium arsenate. The beginning dose should be small, about 3 minims of Fowler's solution, and, if there is no improvement and no unfavorable symptoms from the arsenic itself, the dose may be gradually increased. The average dose is about 4 or 5 minims. The alkalies are, as already referred to, useful in the rheumatic and gouty cases, but independent of any such recognized factor or complication, they seem to be extremely useful in the actively inflammatory disease occurring in robust and plethoric individuals. Liquor potassæ, in doses of 10 to 30 drops, largely diluted, three times daily, is one of the most valuable of the alkaline remedies. It is also especially in this last class of cases that wine of antimony may be tried, giving 5 to 8 drops three times daily. Oil of turpentine is given in 10- to 30-drop doses three times daily, in capsule or emulsion, preferably the latter. During its administration,

and also with the administration of the oil of copaiba, large doses of water should be taken throughout the day, or some demulcent drink such as barley-water. Its action upon the kidneys and bladder must be carefully watched, especially if the largest doses are given. Tar may be administered in capsule or emulsion, the dose being 10 to 30 minims. Potassium iodide, if given in large doses, 20 to 60 or more grains thrice daily, will have a favorable influence in some cases, but its effects, especially in the largest doses, should be supervised. Thyroid extract, in 1- to 5- or even 10-grain doses may be tried in persistent obstinate cases, the remedy being discontinued or the dose diminished should any untoward symptom arise.

The external treatment is all-important in most cases. In individuals in whom the disease is sparse, or but slightly inflammatory, a daily warm bath of five to twenty minutes' duration, or a weak alkaline bath, will, along with suitable systemic treatment, often bring about a favorable result. Even in more extensive cases, more especially where the spots or patches are small, this same plan of external treatment, especially with the alkaline baths, will prove curative. If the skin should, as a result of the use of the alkaline baths, become somewhat harsh and dry, some simple ointment may be rubbed in after each bath. Equal parts of petrolatum, cold cream, and lanolin, with 10 grains of salicylic acid to the ounce, is a good formula. The bath is, of course, to be employed in all cases of the disease not only for the slight or great influence in itself which may be exerted, but also for the reason that it is essential in keeping the patches free from scales; this latter condition is necessary for the proper and efficacious application of the active remedies to be referred to. In markedly acute cases or in cases of a markedly inflammatory type, bran or starch baths may be demanded at first till the acuteness of the symptoms has subsided. Cases are unusual, however, in which mild alkaline baths cannot be employed from the first. The most useful alkalies are sodium carbonate or borate, and ammonium muriate, 2 to 6 ounces to a bath of about 30 gallons. In some cases the sulphur bath, made with potassium sulphuret, 1 to 4 ounces to the bath, is beneficial, followed by a mild or strong salve, according to circumstances.

When the disease exists in large patches or diffused areas, the more active or special external remedies are to be used. The most generally employed at present are tar, chrysarobin, pyrogallic acid, naphthol, white precipitate, aristol, resorcin, gallacetophenone. Tar is one of the oldest applications employed in this disease, and therapeutically speaking it is for the general run of cases the most satisfactory and effective. Its odor bars it out, however, from the general use it otherwise deserves. The pure tar ointment, at first weakened

with lard or petrolatum, the oil of cade, and the oil of birch, 1 to 3 drachms to the ounce of simple cerate or prepared suet, or with olive oil or alcohol, or pure, are the preparations most in use. The ordinary tar ointment is the most objectionable. Another preparation of tar is that known as liquor carbonis detergens. This last is a solution of coal-tar in the tincture of soap-bark. It is not so efficient as common tar, but it is much more elegant and its odor is less persistent. It may be used pure or weakened with water, and rubbed into the patches, or it may be incorporated with simple cerate or suet, 2 or 3 drachms to the ounce; or it may be prescribed with an equal part of liquor calcis sulphuratæ and used as such in full strength or weakened with water. Chrysarobin may be applied as an ointment, 30 to 60 grains to the ounce, or as a paint with collodion or gutta-percha solution. In these latter it is common to add 10 to 30 grains of salicylic acid to the ounce. If the collodion is used as the vehicle, 5 minims of castor oil may also be added to the ounce to make the film somewhat more flexible. Pyrogallic acid may be used similarly to chrysarobin and in the same strength; it should not, however, be applied too extensively at one time, for fear of absorption and toxic action. Both of these drugs are active but have some disadvantages. Both stain, chrysarobin very positively, pyrogallic acid slightly; and both, if used carelessly, may provoke a mild or severe dermatitis. Chrysarobin is the more valuable of the two. If carefully used, however, its disadvantages may be guarded against, and if signs of cutaneous irritation show themselves the application may be temporarily suspended. The salve is the most energetic, but thus used the disadvantages mentioned are more apt to present themselves. If the paint is employed, an application is made about every three or four days. At the end of this time the film has either fallen off in part or in entirety, or may be readily washed or picked off, and a new application may be made. Gallacetophenone, aristol, and resorcin are used in the form of ointments, about 40 to 60 grains to the ounce. White precipitate is also employed in the same strength, and as it is a white preparation it is more particularly employed for the disease upon the scalp. Naphthol is a reserve remedy of about the same efficacy as the remedies last mentioned, and is employed as an ointment, 30 to 60 grains to the ounce. An ointment, if employed should be energetically rubbed into the patches, and the excess wiped off and the parts sprinkled with a dusting-powder. If a liquid application is made, such as the liquor carbonis detergens or its admixture with liquor calcis sulphuratæ, it should be rubbed in well; if after a few days the skin should seem harsh, a mild salve is to be used in conjunction with it.

PURPURA.

An opinion as to the outcome or even duration of an attack of purpura cannot be stated with certainty. The milder types (purpura simplex) give rise to no discomfort as a rule, and sooner or later pass away with or without treatment. Occasionally this form persists more or less continuously for months or for several years. Exceptionally it may pass into the hæmorrhagic type, and may then be of possible serious import. In the more severe types (purpura rheumatica, peliosis rheumatica) the symptoms are somewhat more urgent, often including rheumatic pain and swelling of the joints, together with mild or severe febrile disturbance. These cases, also, usually get entirely well in the course of a few weeks or months, but as in the mildest examples of the disease this type may also exceptionally pass into the more grave hæmorrhagic form (purpura hæmorrhagica, "land-scurvy," morbus maculosus Werlhoffii). This grave type is not very common, and the cutaneous hæmorrhages partake more of the nature of ecchymoses and extravasations. There may occur also bleeding from one or several of the mucous surfaces, so that the patient's condition soon develops into one of profound anæmia. In rare instances the hæmorrhages from the mucous surfaces, the mouth, nose, bowels, or lungs, may be so profuse as to lead to rapid collapse and even death.

The treatment of the various forms of purpura vary somewhat according to the type. The remedies usually prescribed are oil of turpentine, oil of erigeron canadensis, ergot, dilute sulphuric acid, tincture of ferric chloride, strychnine, silver nitrate, and gallic acid. If, as in most of the mild examples of the disease, there is no apparent etiologic factor, the remedies to prescribe are ergot, gallic acid, and turpenture. If the disease seems dependent upon, or is associated with, an anæmic or chlorotic condition, then iron, quinine, and strychnine are usually given, commonly in conjunction with one of the purely astringent remedies first named. In the grave cases ergotin, gallic acid, and turpentine are depended upon for controlling the hæmorrhage; other treatment indicated by the general condition of the patient is likewise instituted. Calcium chloride, in doses of 10 to 30 grains three times daily, is another remedy recently advised from which good results have been claimed. In purpura rheumatica and purpura hæmorrhagica perfect rest in the recumbent position should be enjoined as long as the symptoms are urgent. For some time after the disease disappears the state of the patient's health should be looked after, and all possible measures taken to place him in as good general condition as possible; by so doing the possibility of relapses, which are not at all uncommon, may be prevented.

As a rule external applications are not called for in purpura; astringent applications to bleeding mucous surfaces will aid in checking hæmorrhage from these parts.

SCORBUTUS (SCURVY; SEA-SCURVY; PURPURA SCORBUTICA).

This disease often comes under the care of the dermatologist owing to the cutaneous symptoms. The prognosis is favorable, the disease being remediable and usually rapidly so. This is true in cases in which the predisposing causes are no longer acting. When, however, the same bad hygienic conditions, unfavorable circumstances, and ingestion of scanty and unsuitable food are continued, the patient's health becomes gradually worse and worse, and death finally ensues. Successful results, therefore, usually require, first of all, proper hygiene in the wide sense of that term, and proper food, with an abundance of fruit and vegetables. Lemon-juice and lime-juice, for both curative and preventive purposes, have always proved of great value; they should be taken freely. The general condition of the patient must be cared for, and tonics and stimulants prescribed when deemed necessary. The essential treatment, however, lies in the proper food-supply. Unless ulceration is present the cutaneous manifestations, as a rule, require no special attention. If there is ulceration, the ordinary mild and antiseptic astringent ointments and lotions used in eczema may be employed. For the tumid and spongy gums, astringent mouth-washes of myrrh and potassium chlorate may be used.

SEBORRHŒA.

Under this heading is presented the treatment of all those cases of greasy, oily, slightly scaly, and crusted conditions found upon the scalp and about the region of the nose, unaccompanied with any visible signs of inflammation.

Successful treatment requires a careful supervision of the patient's general health, and the importance of this part of the management is not lessened by the fact that present opinion seems to be inclining toward considering the disease as possibly parasitic and contagious. The disease is seen most frequently in those of sedentary habits, in the anæmic and debilitated, and in those of weak digestion. It is true that in a not inconsiderable number of the cases there seems to

be nothing at fault with the general health. In such cases constitutional medication is not called for. The line of systemic treatment depends upon a study of each case. Laxative, digestives, iron and arsenic preparations, and cod-liver oil, are therefore prescribed most frequently. There are no specifics.

As to external treatment it is essential that the scalp or part affected be kept free from scaliness or crusts. This is done by an occasional shampoo in mild cases and a daily washing in the markedly crusted or scaly cases. After the case is under way, the frequency of the shampoo will depend upon the rapidity of the re-accumulation of scales or crusts, and also the amount of soiling brought about with the remedies employed. For average cases the shampoo may be made with the ordinary toilet soap or a boric acid soap; in cases in which the crusting is marked and adherent, the tincture of sapo viridis may be used. In a few of these severe cases one or two preliminary soakings in carbolized oil may be necessary before the crusts yield to the shampoo.

The important remedies for external application are sulphur, resorcin, salicylic acid, salol, aristol, and white precipitate or calomel. Sulphur is employed as an ointment, 30 to 60 grains to the ounce of petrolatum or lanolin and petrolatum; salicylic acid is frequently added to this ointment, or may be prescribed alone, 10 to 20 grains to the ounce; salol, in ointment, 20 to 40 grains to the ounce; white precipitate and calomel, in the same manner and in the strength of 20 to 60 grains to the ounce. Resorcin, probably next to sulphur in value, may be prescribed in aqueous or alcoholic solution, and is extremely useful, especially in the milder cases, and in the severe cases in the later stages of the treatment. The following formulæ are usually prescribed:

℞. Resorcin, gr. xl–lxxx (2.6–5.3);
Glycerin, ♏x–xx (0.65–1.2);
Alcoholis, ℥ss (15.0);
Aquæ dest., q. s. ad f℥iv (120.0).—M.

℞. Resorcin, gr. xl–lxxx (2.6–5.3);
Ol. ricini, ♏x–xx (0.65–1.2);
Alcoholis, f℥iv (120.0).—M.

A valuable addition to the alcoholic lotion, especially when there is a disposition to alopecia, is the alkaloid quinine, 3 to 5 grains to the ounce. Resorcin is also used in ointment form, 10 to 40 grains to the ounce. The applications are to be made, as a rule, once daily; later at less frequent intervals, every two days, and gradually lessen-

ing the frequency to once or twice weekly. In those especially predisposed to the disease and in whom recurrences are common it is advisable to continue the remedial applications once or twice weekly, and to shampoo the head once every ten days or so with a medicated soap of sulphur-naphthol or resorcin. For the oily form of the disease upon the scalp, the alcoholic lotion of resorcin or of resorcin and quinine is especially valuable.

For the greasy, scaly, apparently non-inflammatory patches of seborrhœa, seen on the upper trunk, about the sternum, and between the scapula, the above remedial applications are also curative.

For seborrhœa of the nose and its immediate neighborhood, of the slightly scaly or crusted type, the same plan of treatment as employed for the disease upon the scalp is to be commended, except that the remedies should not be used in more than one-third the strength. An ointment of acetanilide, 5 to 30 grains to the ounce, is also useful here. For the oily seborrhœa of the nose the same remedies and combinations employed in acne and acne rosacea, at first reduced somewhat in strength, are to be advised. Oily seborrhœa is in fact often associated with the milder types of acne rosacea.

TINEA TRICHOPHYTINA (RINGWORM).

Recent investigations have shown that ringworm may be due to several varieties of the trichophyton fungus and to the microsporon Audouini. The latter is responsible for most cases of the diseases as observed on the scalp, and especially for the most chronic type of disease in this region. This knowledge, while it may influence the prognosis in individual cases as to obstinacy, has had no influence upon treatment. The plan of treatment and the strength of the selected remedies depend essentially upon the region affected.

As the disease occurs upon non-hairy portions of the body, much milder applications are usually sufficient than are employed when the disease is upon the scalp. Upon the bearded region moderately strong remedies are required. Upon the crural region mild applications may suffice, but frequently the stronger remedies become necessary. Upon non-hairy parts the most frequently used applications are: An ointment of sulphur, 1 or 2 drachms to the ounce; white precipitate or calomel ointment, 20 to 60 grains to the ounce; a solution of sodium hyposulphite, 1 drachm to the ounce; corrosive sublimate lotion, $\frac{1}{2}$ to 2 grains to the ounce; carbolic acid lotion or ointment, 5 to 30 grains to the ounce; painting with tincture of iodine, pure or diluted with alcohol; or any of the various other remedies to be

mentioned in connection with the treatment of ringworm of the scalp, except that these should be employed in one-third to one-half the strength there noted.

The nails when affected by the ringworm fungus are treated by one of the several applications named, repeatedly made; the parts should be kept closely trimmed, and as much as possible of the diseased areas from time to time scraped away.

Upon the bearded region the same class of remedies is employed, and of about the same strength as above mentioned—made stronger in obstinate cases. Two good plans of treatment for the disease in this region consist of the conjoint use of a corrosive sublimate lotion and the application of one of the mercurial ointments above noted, or an ointment of oleate of mercury, 5 to 20 per cent. strength; the other plan consists of the conjoint use of the lotion of the sodium hyposulphite with the sulphur ointment. The lotion is applied, somewhat weakened, to the whole bearded region in order to prevent the infection of new areas, and to the diseased areas themselves it is applied in the above-prescribed strength, and, after drying, the ointment is well rubbed in. These applications should be made at least twice daily. The parts should be washed with soap and water once daily. Along with the medical treatment, extraction of the hairs from the diseased patches is advisable, as this procedure shortens the period of treatment considerably.

In the crural region, the two plans just referred to will also prove valuable, and often curative. In addition to these two plans, the other remedies already referred to may also be tried. In those cases where there is considerable eczematous irritation, a lotion of boric acid, 15 grains to the ounce, with 5 to 10 grains each of resorcin and carbolic acid to the ounce, will serve to allay the more active symptoms. The addition of an insoluble powder to this lotion, such as 10 to 20 grains of calamine and zinc oxide, will prove of distinct advantage in some cases. Painting the parts with tincture of benzoin or myrrh containing 1 to 4 grains of corrosive sublimate to the ounce may be adopted in obstinate cases. In others the parts may be vigorously and somewhat harshly shampooed with sapo viridis for three to ten minutes, then rinsed off and a mild ointment such as advised in eczema applied.

Ringworm of the scalp when once thoroughly established and of some duration is the bane of dermatological practice. Many cases, especially in the earlier weeks of the disease, will respond to almost any plan, but other cases, usually those which finally gravitate to the care of the dermatologist, prove most intractable, months of persevering treatment often being necessary to effect a cure. If the disease is seen in the first few weeks and is limited to one or two patches,

a good plan of treatment is to paint on daily the tincture of iodine containing 1 or 2 grains of the red iodide of mercury to the ounce. After several days a variable amount of irritation is produced, and it is then temporarily suspended, during which time any of the mild salves already mentioned may be used. In fact, in such cases any of the ointments alone will often prove sufficient to cure the disease. In the more obstinate cases, or those of longer duration, or those which have had many of the ordinary remedies applied without result, recourse must be had to stronger applications. Of these the most valuable are corrosive sublimate, in the form of a lotion, 1 to 4 grains to the ounce; pyrogallic acid, 10 to 40 grains to the ounce of ointment; naphthol ointment, 1 drachm to the ounce; and chrysarobin, 20 to 60 grains to the ounce. This last remedy may also be used in the form of paint with collodion or liquor gutta-perchæ, 30 to 60 grains to the ounce. Strong corrosive sublimate lotions should not be employed if the area of disease is very large; it is to be thoroughly dabbed on twice daily. If one of the ointments is selected it should be well rubbed in for several minutes.

A frequently prescribed, and often efficient, compound ointment employed in dispensary practice is one composed of 1 to 2 drachms of oil of cade, 30 to 60 grains of naphthol, and unguentum sulphuris to make up the ounce.

Chrysarobin is the most active remedy in our possession, but has the disadvantage of often exciting dermatic inflammation of the surrounding skin as well as disagreeable staining properties. If carelessly used, some of it may be carried to the eye and provoke a conjunctivitis. Its use as a paint is less apt to be attended with those disadvantages than in a salve form, although this latter is probably more effective. The paint is applied twice daily for several days, at least till quite a thick coating is formed or signs of active irritation present themselves. It is then discontinued and a mild salve employed till the crust formed comes off or can be readily picked off. If there is much underlying irritation, the salve is continued for a day or two and the painting then resumed. If chrysarobin is employed as an ointment, it is, like the other salves, to be well rubbed in twice daily, and continued till irritation results, then temporarily set aside and a mild ointment employed. If after a time no improvement is noticed, or if after a time improvement ceases, a new plan of treatment is to be adopted. At the end of three or four weeks it is well to intermit treatment, applying a mild lotion or salve for several days, and then take a survey of the condition.

There remains a method which may be adopted in the extremely rebellious cases, in which the patches are few and distinct: the method of producing an active artificial sero-purulent inflammation with croton

oil is referred to. It is a procedure not entirely devoid of danger, and one which may, especially if carelessly used, be followed with permanent hair loss, and therefore it should not be employed except in suitable and urgent cases. But one area, and that not over an inch in diameter, is to be treated at a time. The oil, at first with two parts of olive oil, is carefully painted on with a fine brush, using a minute quantity. This is repeated twice daily. After two or three days acute inflammation should be excited. If this has not resulted a stronger application must be made use of. After the inflammatory action is aroused, a mild ointment, containing ½ drachm or 1 drachm of boric acid or 10 or 20 grains of sulphur to the ounce, is to be used. As soon as this inflammation has subsided, another patch may be attacked. Occasionally a second application to the same area is necessary. Lactic acid, at first diluted with one or two parts of water, may take the place of croton oil, but it is not so surely effective.

There are certain other procedures in the management of ringworm of the scalp which remain to be mentioned. If the diseased area is large and irregularly distributed it is advisable to have the hair closely cropped over the entire scalp; if there are but a few well-defined patches, then it should be cut very close on and around the patches and be allowed to remain about one-half to three-quarters of an inch long over the remaining portions. This facilitates treatment, and permits the early discovery of any other points of infection. In addition to the application of the stronger remedies to the diseased areas themselves, a general application should be made to the entire scalp to prevent the disease spreading. For this purpose a weak corrosive sublimate lotion, ½ to 1 grain to the ounce, may be used, or a lotion of carbolic acid, 2 to 3 drachms to the pint, or a saturated boric acid solution containing carbolic acid and 2 or 3 drachms of resorcin to the pint. The general application of sodium hyposulphite solution, 1 drachm to the ounce, applied freely, following the next morning with dilute acetic acid or vinegar, giving rise to nascent sulphuric acid, is usually efficient as a preventive and in mild cases curative. Or an ointment of sulphur, 1 drachm to the ounce, may be employed for this purpose.

Another procedure which is of great value is the extraction of the hairs from the diseased patch, as this materially shortens the time of treatment. This cannot be readily done if a large part of the scalp is involved.

As to soap-washing, it is advisable to employ a medicated soap such as a sulphur-naphthol soap. The entire scalp should be washed about every two days, and the lather allowed to remain on for five or ten minutes before rinsing off; immediately afterward the general

preventive applications should be made, and also the stronger remedial application to the individual patches or areas.

While ringworm is parasitic and considered entirely local, it is advisable that the patient's general health be looked after. Plain, nutritious food, and tonics such as iron, cod-liver oil, and the hypophosphites are frequently prescribed with apparent advantage.

TINEA VERSICOLOR (CHROMOPHYTOSIS).

The most satisfactory remedies in the treatment of this disease are sodium hyposulphite, a sulphurated sapo viridis, corrosive sublimate solutions, and naphthol ointments. This list could be materially increased; in fact, any of the remedies suggested for the treatment of ringworm will prove efficacious in this disease, if regularly used and sufficiently long continued. Sodium hyposulphite is applied in the form of lotion, 1 drachm to the ounce; corrosive sublimate as a lotion, 1 to 3 or 4 grains to the ounce; naphthol as an ointment, ½ to 1 drachm to the ounce. The parts affected should be thoroughly treated with the selected remedy; if a lotion dabbing it well on, and if an ointment rubbing it well in. The parts should be washed once daily; in mild cases with ordinary toilet soap, and in more extensive and obstinate cases with sapo viridis.

The best method of treatment in the average case is the conjoint use of the sodium hyposulphite lotion, and the daily washing with the sulphurated sapo viridis. This latter is variously made of from 1 to 3 drachms of precipitated sulphur to the ounce of sapo viridis.

In extremely rebellious cases the parts may be thoroughly shampooed with this soap, the lather allowed to remain on; this process is repeated once daily till a moderate degree of irritation results, when the accumulated soapy applications are rinsed off. If there should result any marked irritation or an unpleasant tightness of the skin a mild salve is to follow.

The recurrences frequently observed in this disease are, in great measure at least, due to the fact that treatment is stopped as soon as the affection is apparently cured. It is probable that some fungus may remain in the upper part of the follicles, or in the pubic region concealed by the hair, and form foci for a recurrence. Therefore remedial applications should be made once or twice weekly for several months after the visible eruption has been removed. Another possible source of recurrence also is the underwear; the patient should be advised of the necessity of a thorough disinfection of these garments.

URTICARIA.

Acute urticaria is usually caused by acute indigestion or the eating of some food that disagrees, or which in the individual, from some idiosyncrasy, acts as a poison. The accepted treatment consists substantially in the administration of a laxative, preferably a saline, and an antacid, such as sodium salicylate, 5 grains three or four times daily, or sodium bicarbonate: this latter especially in children. Many cases of the acute disease will respond at once to a nightly dose of the ordinary calcined magnesia, repeated two or three nights if necessary. This remedy combines both laxative and antacid properties and is extremely valuable. In urgent acute attacks when the disease involves the epiglottis and throat, with symptoms of an alarming character, an emetic may be administered to get rid of the offending substance in the stomach; the subsequent treatment consisting of a saline and antacids or two or three doses of calcined magnesia.

The most common causes of chronic urticaria are digestive or assimilative irregularities, neurasthenic conditions, and in women functional or organic disease of the utero-ovarian system. In many cases, it is true, the cause is difficult to recognize. Depending upon the etiological factor systemic treatment will vary. Probably, in the majority of cases, antacids and intestinal antiseptics, such as salol, with remedies to tone up the digestion, with an occasional saline, will be most fruitful of results. Independently of any assignable cause empirical remedies may be resorted to. Of these the most valuable are belladonna or its alkaloid, atropine, sodium salicylate, pilocarpine, ergot, potassium bromide, antipyrin, phenacetin, gelsemium, strychnine, and minute doses of nitro-glycerin. In obstinate cases a rigid milk-diet, with relaxation from care and work, will bring about a curative result. In especially obstinate cases a change of air and climate may be advised.

As to the external treatment, ordinarily some domestic application, such as vinegar, a tablespoonful of vinegar to a teacupful of water, and dilute alcoholic lotions, will be sufficient to relieve the irritation pending the action of systemic remedies. In the chronic cases, however, the more active anti-pruritic remedial applications will be required. Of these the best are carbolic acid, 1 to 3 drachms to the pint of water, to which one or two ounces of alcohol may be added with advantage; liquor carbonis detergens diluted with several or more parts of water and gradually strengthened even up to the pure solution; a saturated solution of boric acid, with or without carbolic acid; mild alkaline lotions, 1 to 3 or 4 grains of sodium carbonate to the ounce of water. In extensive cases tepid bran-baths or mild alkaline baths will often give temporary relief. In persistent cases

where the relief from these several applications is unsatisfactory, the various other applications referred to in the treatment of pruritus may be prescribed. In those exceptional cases of urticaria in which some of the lesions become bullous, the larger bullæ should be punctured and emptied, and some mild salve such as the oxide-of-zinc ointment applied spread upon lint. Or the lotion may be employed first, allowed to dry, and then the ointment applied.

XERODERMA PIGMENTOSUM.

This disease, also called "parchment skin," and "angioma pigmentosum et atrophicum," is rare. It has been noted to occur in several children of the same family. It appears in the first few years of life. Its most prominent symptoms are numerous disseminated freckle-like pigment-spots, telangiectases, more or less shrinking and contraction of the skin, atrophied muscles, and sometimes minute warts or wart-like lesions—later in its course epitheliomatous growths and ulceration appear. Its course is slow, usually extending over years. Death finally results. There is apparently a congenital predisposition. The disease is probably a degenerative atrophy.

Treatment is palliative, and based upon general principles.

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